UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Selected geochemical data and geochemical plots from U.S. Department of Energy-National Uranium Resources Evaluation on sediment samples from the Table Mountain 1° x 3° quadrangle, Brooks Range, Alaska

By

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This report shows the results of a computer treatment by the U.S. Geological Survey of data generated by the NURE program of DOE. The analyses and sampling were done for the NURE program under the auspices of the Los Alamos Scientific Laboratories.

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GENERAL PURPOSE AND DISCUSSION

This report summarizes some of the principal features of geochemical data on the Table Mountain 1° x 3° quadrangle, Brooks Range, Alaska, accumulated under the National Uranium Resource Evaluation (NURE) and nationwide Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) program of the U.S. Department of Energy (DOE). The data were obtained from reports and a magnetic tape provided by the Los Alamos National Laboratories (LANL), 1981, Los Alamos, New Mexico, and the Oak Ridge Gaseous-Diffusion Plant (ORGDP), 1981, Oak Ridge, Tennessee.

A total of 1,170 stream sediments were collected and analyzed under the auspices of the Los Alamos Scientific Laboratories, New Mexico. The general analytical methods used and their lower limits of detection are listed in table 1.

Statistical summaries of the data are given in tables 2 and 3. The analytical methods used to produce the data summarized in tables 2 and 3, like all methods for trace-element analysis, can be used to determine concentrations only within certain ranges of concentration. These ranges vary not only from one chemical element to another, but also, because of matrix effects, among individual sediment samples. The lower limits of determination, in particular, vary so that the data for a single element may contain any number of different "less than" values. Comparisons of these "less than" values with each other, or with other values that are not qualified with the "less than" symbol, are not always informative. For example, two reported values of <100 and <200 provide no means whatsoever for comparing the two analyzed samples. Either of the samples may contain more of the element than the other, or the two actual concentrations may be equal. The same difficulties are present in comparing "less than" values with some unqualified values, for example, in comparing the values <100 and, say, 50. Difficulties such as these are prevalent in the NURE-HSSR data, and, therefore, all the data for each variable had to be adjusted to a common lower limit before any further data processing was begun. The methods used to achieve this adjustment are as follows. A number of possible lower limits to which the data could be adjusted were considered for each chemical variable. These lower limits included each different "less than" value for the variable and the lowest unqualified value. The changes in the reported values required in order to adjust the data to each possible lower limit were then counted, and the data finally were adjusted to the lower limit that called for the fewest changes. The necessary changes included (1) the discard of "less than" values greater than the lower limit being considered (that is, conversion of such values to blanks), and (2) the conversion of unqualified values less than the lower limit to "less than" values (that is, "less than" the lower limit being considered). Both these types of changes are legitimate in that neither violates the determination of the analyst. The loss of information that results from the changes is the price paid for achieving data that are internally consistent, and, therefore, susceptible to meaningful interpretation either by data inspection or by mathematical and statistical analysis.

In order to save time and to emphasize only relevant detail in the preparation of the computer-generated geochemical maps, the following system has been devised:

Figure 1 is a master map, or template, for use in orienting all illustrations in the text. The template shows latitude, longitude, scale, major drainages, and the outline of the 24 (scale 1:63,360) individual quadrangles that make up the Table Mountain quadrangle.

Figure 2 is a generalized geologic map of the Table Mountain quadrangle modified from Grybeck and others (1977).

Figure 3 is a locality map showing the sites at which sediments were sampled in the Table Mountain quadrangle.

These three figures will be helpful in examination and interpretation of the geochemical maps that constitute figure 4.

Figure 4 is a series of geochemical maps; each map is for a single element (which is noted at the bottom of the map). These maps were constructed simply by plotting the symbols that represent the approximate percentiles of the values or range of values of each element at their respective geographic localities. The geochemical maps show the observed element distribution without correction for local geology or local geochemical background.

Table 4 is a master key for use in interpretation of the symbols used on the geochemical maps of figure 4. These symbols correspond to a range of selected percentiles and may be converted to approximate concentrations from tables 2 and 3.

REFERENCES CITED

Grybeck, Donald, Beikman, H. M., Brosge, W. P., Tailleur, I. L., and Mull, C. G., 1977, Geologic map of the Brooks Range, Alaska: U.S. Geological Survey Open-File Map 77-166B.

Los Alamos National Laboratory, 1981, Uranium hydrogeochemical and stream-sediment reconnaissance of the Table Mountain NTMS quadrangle, Alaska: U.S. Department of Energy, Grand Junction Office, report GJBX 256(81), 90 p.

Nunes, H. P., and Weaver, T. A., 1978, Hydrogeochemical and stream-sediment reconnaissance of the National Uranium Resource Evaluation Program in the Rocky Mountain States of New Mexico, Colorado, Wyoming, and Montana, and the State of Alaska: U.S. Department of Energy, Grand Junction Office, report GJBX 27(78), 14 p.

Oak Ridge Gaseous Diffusion Plant, 1981, Hydrogeochemical and stream-sediment reconnaissance basic data for Table Mountain quadrangle, Alaska: U.S. Department of Energy, Oak Ridge Gaseous Diffusion Plant, report GJBX 223(81), 107 p.

TABLE 1.--Methods of analysis and lower limits of detection

[ppm = parts per million; XRF = Energy dispersive X-ray fluorescence; NAA = neutron activation analysis; ES = emission spectroscopy; DNC = Delayed neutron counting; typical lower detection values for neutron activation analyses are given below; actual detection limits vary depending on the composition of the sample; from Nunes and Weaver (1978, p. 11)]

Element	Analytical method	Lower limit of detection (ppm)	Element	Analytical method	Lower limit of detection
Ag	XRF	5	Mg	NAA	0.3
Al	NAA	200	Mn	NAA	3,000
As	XRF	5	Na	NAA	10
Au	NAA	0.01	Nb	NAA	150
Ba	NAA	300	Ni	XRF	20
Be	ES	1	Pb	XRF	15
Bi	XRF	5	Rb	XRF	5
Ca	NAA	4,000	Sb	NAA	30
Cd	XRF	5	Sc	NAA	1
Ce	NAA	10	Se	XRF	0.1
Cl	NAA	200	Sm	NAA	0.5
Co	NAA	2	Sn	XRF	10
Cr	NAA	20	Sr	NAA	300
Cs	NAA	2	Ta	NAA	1
Cu	XRF	10	Tb	NAA	1
Dy	NAA	2	Th	NAA	0.8
Eu	NAA	0.8	Ti	NAA	200
Fe	NAA	2,000	U	DNC	0.2
Hf	NAA	1	V	NAA	5
K		NAA	2,000	W	XRF15
La	NAA	6	Yb	NAA	3
Li	ES	1	Zn	NAA	20
Lu	NAA	0.3	Zr	XRF	5

Table 2.--Summary of qualified and unqualified values for sediment samples, Table Mountain quadrangle, Alaska

[Qualified values are those with an associated alpha code. The code indicates that the concentration was either not determined or was found to be above or below the normal range of detection for the analytical method. The code for concentrations found to be below the range of detection is L (less than); the code for concentrations above the range is G (greater than); if no analysis is available the code is B (blank). All minimum and maximum values are in parts per million (ppm). **** indicates no data]

	VARIABLE	NUMBER OF QUALIFIED VALUES B	L	G	NUMBER OF UNQUALIFIED VALUES	RANGE OF UNQUALIFIED VALUES MINIMUM	MAXIMUM
1	LAT	0	0	0	1170	68.01	69.00
2	LONG	0	0	0	1170	141.01	144.00
3	U	0	0	0	1170	0.18	26.30
4	Ag	1170	0	0	0	**********	**********
5	Bi	5	1044	0	121	5.00	14.00
6	Cd	5	1151	0	14	5.00	10.00
7	Cu	5	90	0	1075	10.00	452.00
8	Nb	1170	0	0	0	**********	**********
9	Ni	5	157	0	1008	15.00	125.00
10	Pb	5	517	0	648	5.00	417.00
11	Sn	5	1138	0	27	10.00	196.00
12	W	5	1129	0	36	15.00	39.00
13	As	5	295	0	870	5.00	343.00
14	Se	5	1150	0	15	5.00	10.00
15	Zr	5	0	0	1165	12.00	1333.00
16	Mo	1170	0	0	0	**********	**********
17	Be	1170	0	0	0	**********	**********
18	Li	1170	0	0	0	**********	**********
19	Al	7	2	0	1161	1381.00	103500.00
20	Au	5	1158	0	7	0.18	0.43
21	Ba	83	269	0	818	267.00	2564.00
22	Ca	11	69	0	1090	2647.00	373100.00
23	Ce	27	133	0	1010	11.00	738.00
24	Cl	27	1076	0	67	194.00	640.00
25	Co	122	196	0	852	1.40	184.80
26	Cr	26	61	0	1083	21.00	224.00
27	Cs	87	381	0	702	2.70	29.10
28	Dy	72	7	0	1091	1.00	18.00
29	Eu	110	19	0	1041	0.20	7.50
30	Fe	3	1	0	1166	734.00	324200.00
31	Hf	85	257	0	828	1.80	38.10
32	K	92	251	0	827	5225.00	32290.00
33	La	62	110	0	998	10.00	657.00
34	Lu	13	358	0	799	0.20	0.90
35	Mg	73	175	0	922	2461.00	61090.00
36	Mn	0	0	0	1170	22.00	72740.00
37	Na	2	0	0	1168	82.00	16600.00
38	Rb	74	873	0	223	78.00	249.00
39	Sb	10	1147	0	13	4.00	7.00
40	Sc	2	1	0	1167	0.40	25.30
41	Sm	60	14	0	1096	0.60	63.80
42	Sr	1009	0	0	161	167.00	692.00
43	Ta	3	1165	0	2	5.00	7.00
44	Tb	79	1075	0	16	2.00	5.00
45	Th	88	11	0	1071	0.60	70.60
46	Ti	122	65	0	983	515.00	8687.00
47	V	13	34	0	1123	15.00	261.00
48	Yb	134	511	0	525	2.40	13.30
49	Zn	113	232	0	825	84.00	597.00

Table 3.--Percentile concentrations of elements (in parts per million) in sediment samples from the Table Mountain quadrangle, Alaska

[xxx indicates no data or value not detected or less than lower limit of detection]

			VARIABLE										
PERCENTILE	LAT	LONG	U	Bi	Cd	Cu	Ni	Pb	Sn	W	As	Se	Zr
99.0	68.98	143.97	11.03	8	5	97	76	46	38	18	64	5	340
97.5	68.97	143.94	7.05	7	****	63	66	25	****	15	36	****	275
95.0	68.95	143.86	5.27	6	****	48	60	17	****	****	25	****	231
90.0	68.90	143.71	4.46	5	****	39	51	14	****	****	19	****	201
80.0	68.81	143.43	3.77	****	****	32	42	11	****	****	13	****	163
50.0	68.50	142.49	3.13	****	****	22	29	5	****	****	8	****	101
20.0	68.20	141.62	2.58	****	****	14	18	****	****	****	****	****	48
10.0	68.11	141.30	2.23	****	****	11	****	****	****	****	****	****	31
5.0	68.06	141.16	1.82	****	****	****	****	****	****	****	****	****	23
2.5	68.04	141.07	1.06	****	****	****	****	****	****	****	****	****	19
1.0	68.02	141.04	0.64	****	****	****	****	****	****	****	****	****	15

				VARIABLE								
PERCENTILE	Al	Au	Ba	Ca	Ce	Cl	Co	Cr	Cs	Dy	Eu	Fe	Hf
99.0	80330	****	1524	316900	103	361	64.60	151	16.50	8	2	105300	11.90
97.5	74940	****	1173	280400	86	286	29.90	134	11	7	1.70	81840	9.20
95.0	70180	****	1009	256000	77	203	21.10	120	8.10	7	1.60	52620	7.90
90.0	65270	****	872	211000	69	****	16.70	109	6.70	6	1.50	43610	6.80
80.0	57950	****	743	135200	58	****	12.40	95	5.50	5	1.30	35940	5.70
50.0	41690	****	486	22830	41	****	7.30	72	3.60	4	1	25440	3.60
20.0	19000	****	****	7960	19	****	1.70	46	****	3	0.60	13080	****
10.0	9733	****	****	5165	****	****	****	31	****	2	0.40	6910	****
5.0	5847	****	****	****	****	****	****	****	****	1	0.30	4933	****
2.5	4018	****	****	****	****	****	****	****	****	1	0.20	3774	****
1.0	2940	****	****	****	****	****	****	****	****	1	****	1981	****

Table 3.--Percentile concentrations of elements (in parts per million) in sediment samples from the Table Mountain quadrangle, Alaska-Continued

[xxx indicates no data or value not detected or less than lower limit of detection]

PERCENTILE	VARIABLE K	La	Lu	Mg	Mn	Na	Rb	Sb	Sc	Sm	Sr	Ta	Tb
99.0	24200	55	0.60	31840	4853	9348	158	4	18.60	9.10	622	****	2
97.5	22430	43	0.50	17200	3162	7738	134	****	17.40	7.30	573	****	****
95.0	20050	40	0.40	11910	2071	6939	116	****	16	6.50	550	****	****
90.0	17830	36	0.40	9210	1292	6068	100	****	14.10	5.90	511	****	****
80.0	15280	33	0.30	6824	758	4692	78	****	12.20	5	456	****	****
50.0	10700	26	0.20	4908	323	2605	****	****	9	3.50	339	****	****
20.0	****	16	****	2975	139	1050	****	****	4.30	2	266	****	****
10.0	****	10	****	****	94	565	****	****	2.40	1.30	240	****	****
5.0	****	****	****	****	66	395	****	****	1.60	1	224	****	****
2.5	****	****	****	****	47	269	****	****	1	0.70	208	****	****
1.0	****	****	****	****	38	190	****	****	0.60	****	167	****	****

PERCENTILE	VARIABLE Th	Ti	V	Yb	Zn
99.0	18.60	6329	202	6.10	412
97.5	13	5697	183	5.20	335
95.0	11.30	5239	171	4.60	284
90.0	9.90	4787	155	4	246
80.0	8.60	4179	137	3.40	207
50.0	6.20	2978	100	2.40	142
20.0	3.30	1565	54	****	****
10.0	2.10	848	34	****	****
5.0	1.40	****	22	****	****
2.5	1	****	****	****	****
1.0	****	****	****	****	****

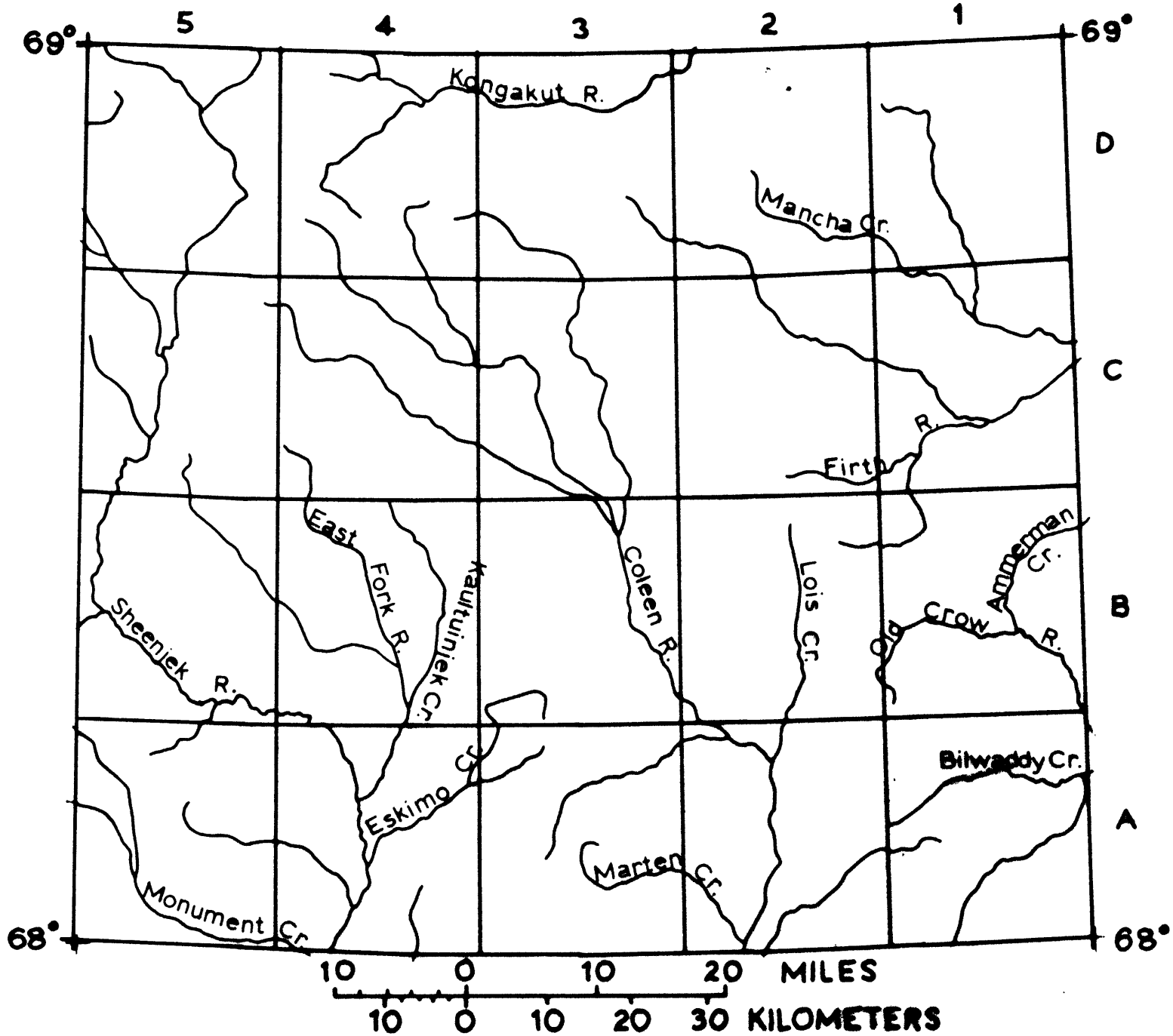


Figure 1. Master map for use in orienting all illustrations.

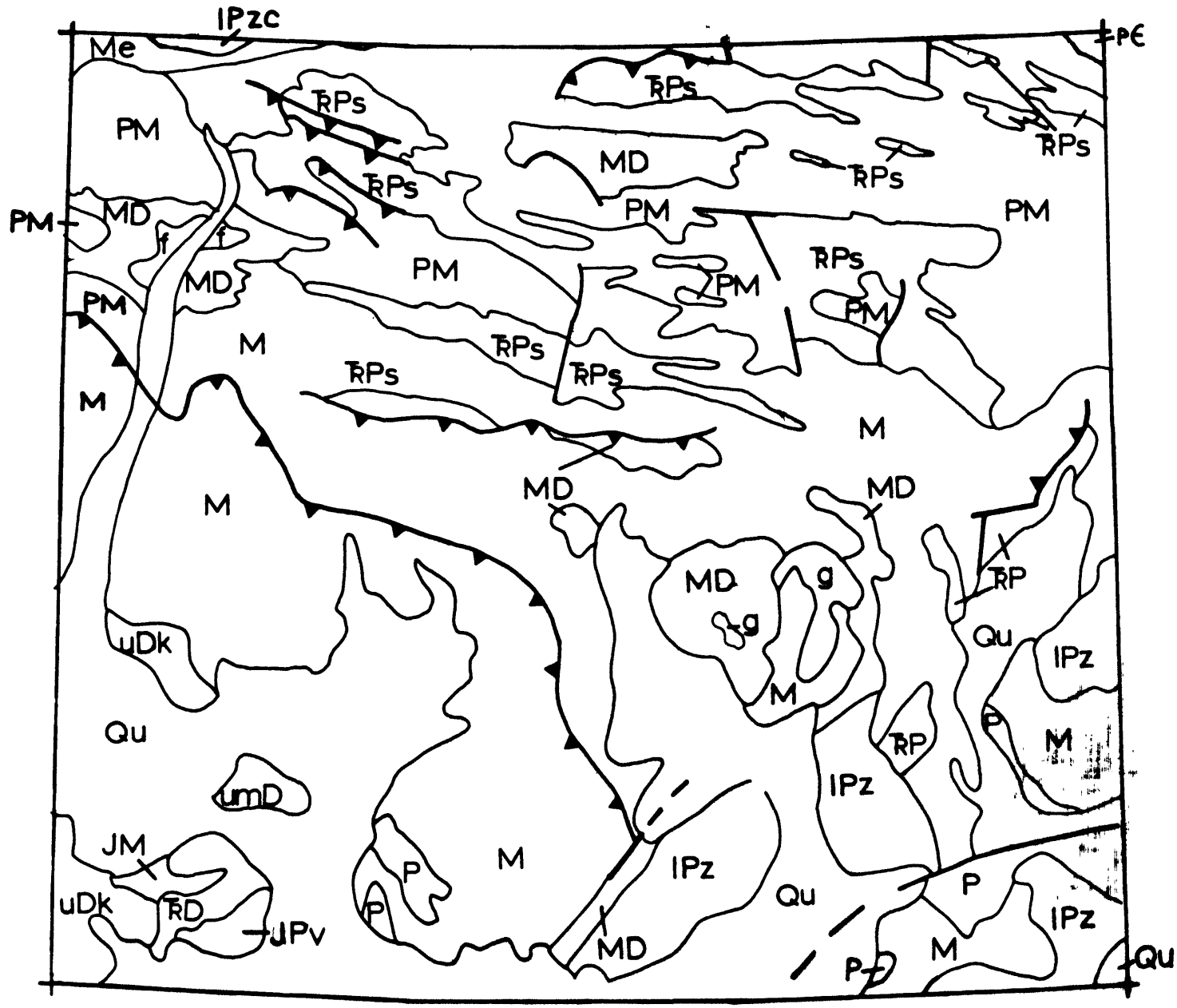


Figure 2. Generalized geologic map of the Table Mountain quadrangle, Alaska. [From Donald Grybeck, Helen M. Beikman, William P. Brosgé, Irving L. Tailleur, and Charles G. Mull, 1977]

Figure 2A. Explanation for geologic map, Table Mountain quadrangle, Alaska. [From Donald Grybeck, Helen M. Beikman, William P. Brosgé, Irving L. Tailleur, and Charles G. Mull, 1977]

DESCRIPTION OF ROCK UNITS

STRATIFIED SEDIMENTARY AND VOLCANIC ROCKS,

IN PART METAMORPHOSED

Qu	QUATERNARY DEPOSITS, UNDIFFERENTIATED.--Includes flood plain, alluvial, morainal, outwash, eolian sand, loess, terrace, beach, and landslide deposits
TR Ps	TRIASSIC AND PERMIAN SADLEROCHIT GROUP ROCKS.--Sandstone, siltstone, and shale of the Sadlerochit Group in the northeastern Brooks Range.
TR P	TRIASSIC AND PERMIAN ROCKS.--Undifferentiated Shublik and Echooka Formations in the Coleen River area and undifferentiated Shublik Formation and Permian rocks in western Brooks Range
P	PERMIAN ROCKS.--Mostly chert, shale, and siltstone of the Siksikpuk Formation, but includes shale, siltstone, and limestone of the Echooka Formation in the southeastern Brooks Range
PM	PENNSYLVANIAN AND MISSISSIPPIAN CARBONATE AND CLASTIC ROCKS.--Limestone, dolomite, chert, shale, and conglomerate. Includes Kekiktuk Conglomerate and Kayak Shale, both of Mississippian Endicott Group, and the Alapah, Wachsmuth, and Wahoo Limestones of the Lisburne Group (Mississippian and Pennsylvanian). Unit differentiated only in eastern Brooks Range. Locally includes Ps in Phillip Smith Mountains and Arctic quadrangles
M	MISSISSIPPIAN CARBONATE AND CLASTIC ROCKS.--Mostly limestone with subordinate shale, chert, and dolomite. Includes the Utukok and Kogruk Formations of the western Brooks Range; includes all of the Lisburne Group, and the Kayak Shale of the central Brooks Range
Me	MISSISSIPPIAN CLASTIC ROCKS.--Includes the Kekiktuk Conglomerate and Kayak Shale of the Endicott Group in the northeast portion of the area and correlative shale and conglomerate near upper Noatak River. Includes minor amounts of unnamed brown sandstone of Middle(?) Devonian age northeast Brooks Range
JM	JURASSIC TO MISSISSIPPIAN ROCKS.--Slate and fossiliferous quartzite of Jurassic and Mississippian age in the southeast corner of the area. Chiefly chert and subordinate fine-grained clastic rocks in western Brooks Range

TrD — TRIASSIC TO DEVONIAN ROCKS.--Radiolarian chert, slate, and argillite of undetermined thickness in southeast portion of area

MD — MISSISSIPPIAN AND (OR) DEVONIAN ROCKS.--Sandstone, quartzite, graywacke, and quartz-chert conglomerate. Includes the Noatak Sandstone in western Brooks Range and undifferentiated Kekiktuk or Kanayut Conglomerate. Includes unnamed Devonian(?) brown sandstone on upper East Fork, Chandalar River. Consists mainly of a conglomerate unit in the DeLong Mountains

uDk — UPPER DEVONIAN CONGLOMERATE.--Consists of a clastic sequence of conglomerate and quartzite of the Kanayut Conglomerate in the Endicott Group

umD — LOWER UPPER AND (OR) UPPER MIDDLE(?) DEVONIAN ROCKS.--Conglomerate, graywacke, chloritic phyllite, calcareous shale and sandstone, siltstone, and minor limestone

lPz — LOWER PALEOZOIC UNDIFFERENTIATED.--Graywacke and mudstone unit near Pint Hope and semischist and phyllite unit at the southeast corner of the map

VOLCANIC ROCKS

JPv — JURASSIC, TRIASSIC, AND PERMIAN VOLCANIC ROCKS.--Ophiolite complex of mafic volcanic and intrusive rocks. Complex is composed of basalt, diabase, diorite, gabbro, radiolarian chert, peridotite, and dunite. In places includes flows, tuffs, breccias, and interbedded sediments

f — RHYOLITIC VOLCANIC ROCKS OF UNKNOWN AGE.--Occur south of Romanzof Mountains where they may be Paleozoic in age. Also in the lower Paleozoic-Precambrian rocks and lower Paleozoic rocks north of the Kobuk River interbedded in the schists

PLUTONIC AND HYPABYSSAL ROCKS

g — GRANITIC ROCKS OF UNKNOWN AGE.--Predominantly quartz monzonite at the eastern end of the area

EXPLANATION FOR GEOLOGIC MAP

High-angle fault or fault whose attitude is unknown--Dashed where inferred

Thrust fault--Dashed where inferred. Sawteeth on upthrown block

Contact

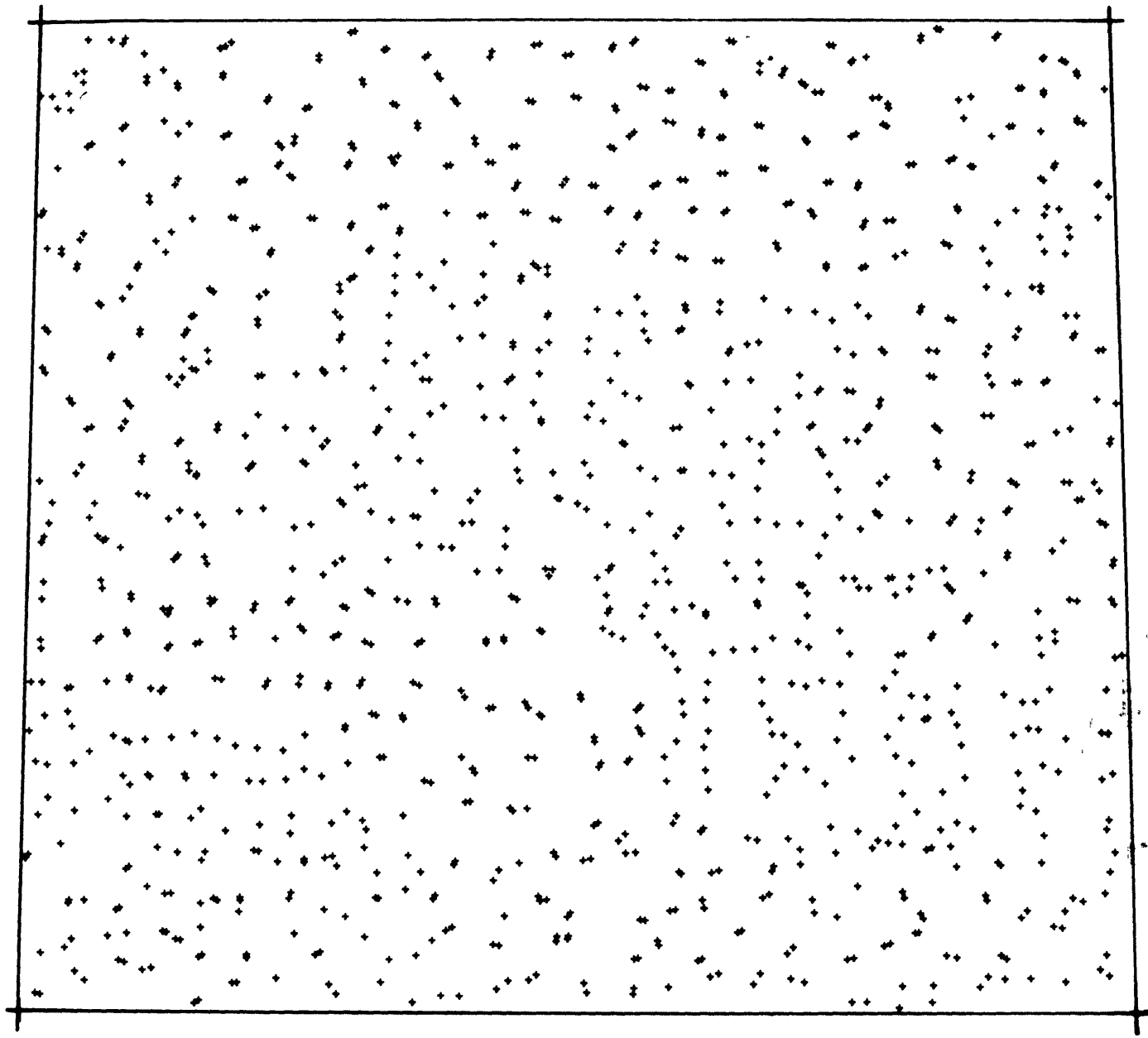


Figure 3. Locality map showing sites at which sediments were sampled, Table Mountain quadrangle, Alaska.

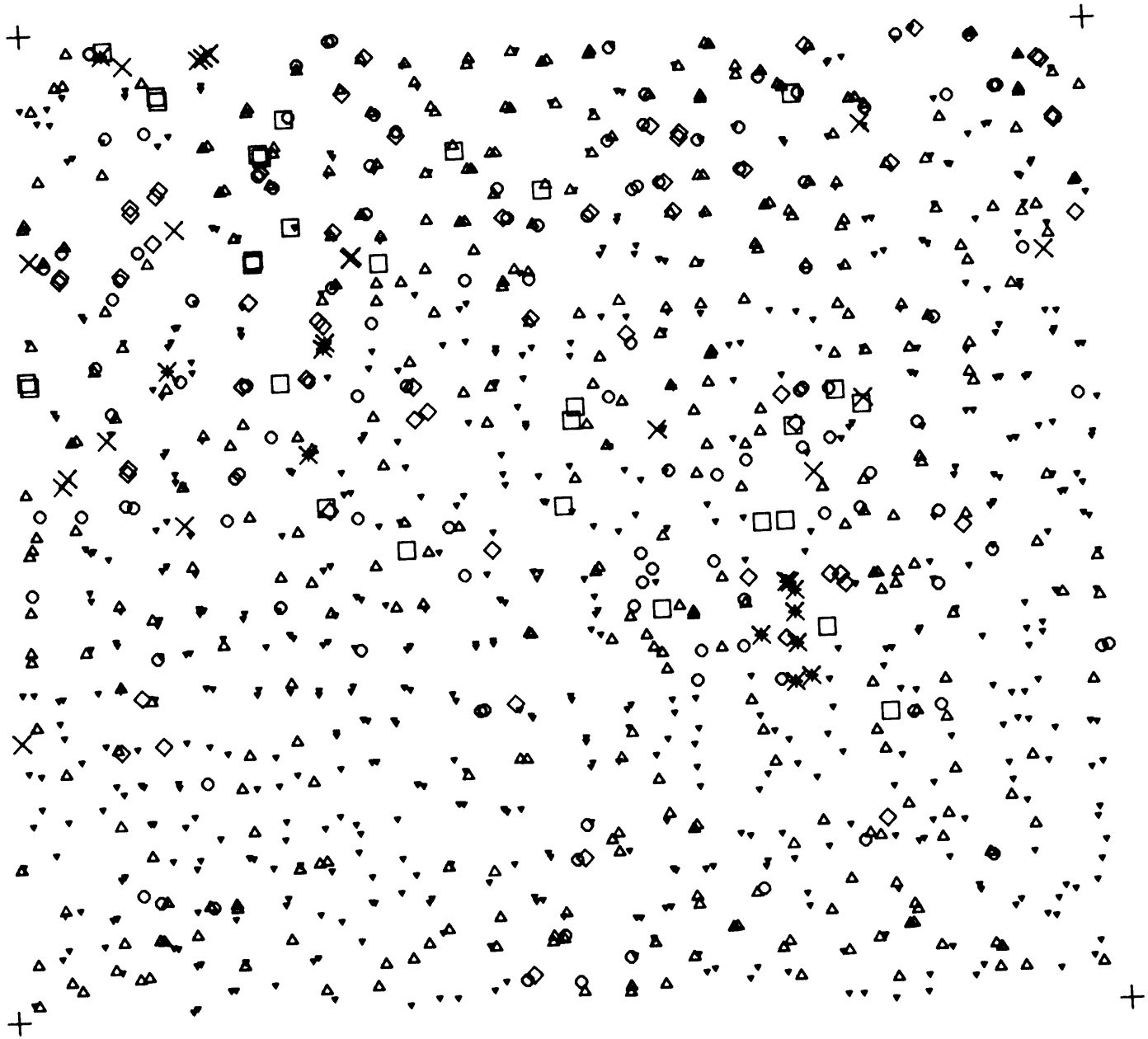
TABLE MOUNTAIN, ALASKA

TABLE 4.--Master key for use in interpretation of geochemical symbol data represented in figure 4

[Symbols that represent percentile ranges/minimum values may be converted to concentrations from tables 2 and 3]

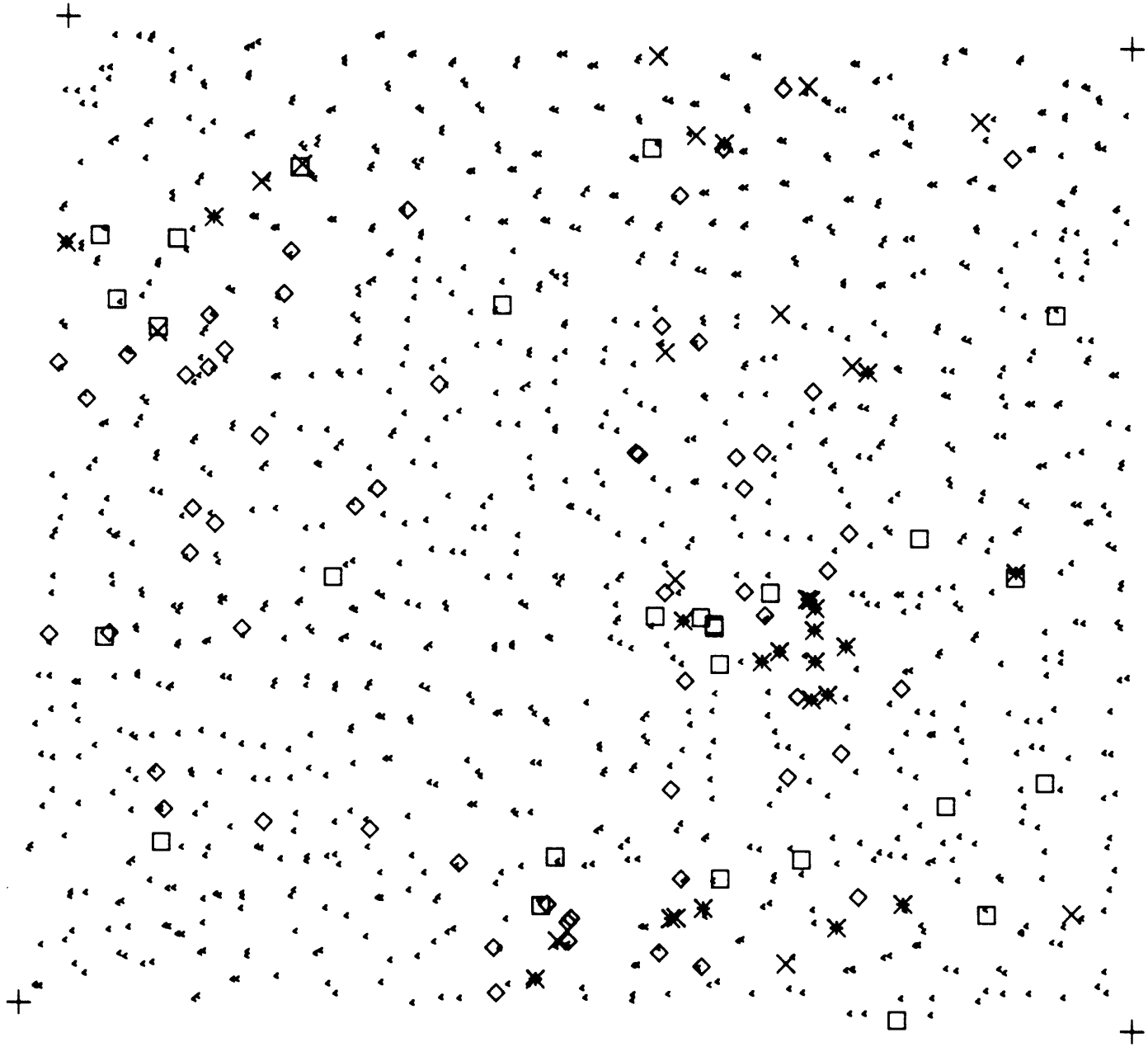
Symbol	Explanation	
✱	=/>99th percentile	
X	=/>97.5 percentile	<99th percentile
□	=/>95th percentile	<97.5 percentile
◇	=/>90th percentile	<95th percentile
○	=/>50th percentile	<90th percentile
△	=/>50th percentile	<80th percentile
▽	=/<20th percentile	<50th percentile
	to the minimum value	
<	Concentration less than minimum value; not detected	

Figure 4. Geochemical maps showing the distribution of selected percentiles of each element by the use of symbols that may be converted to concentrations of elements in sediments, Table Mountain quadrangle, Alaska.



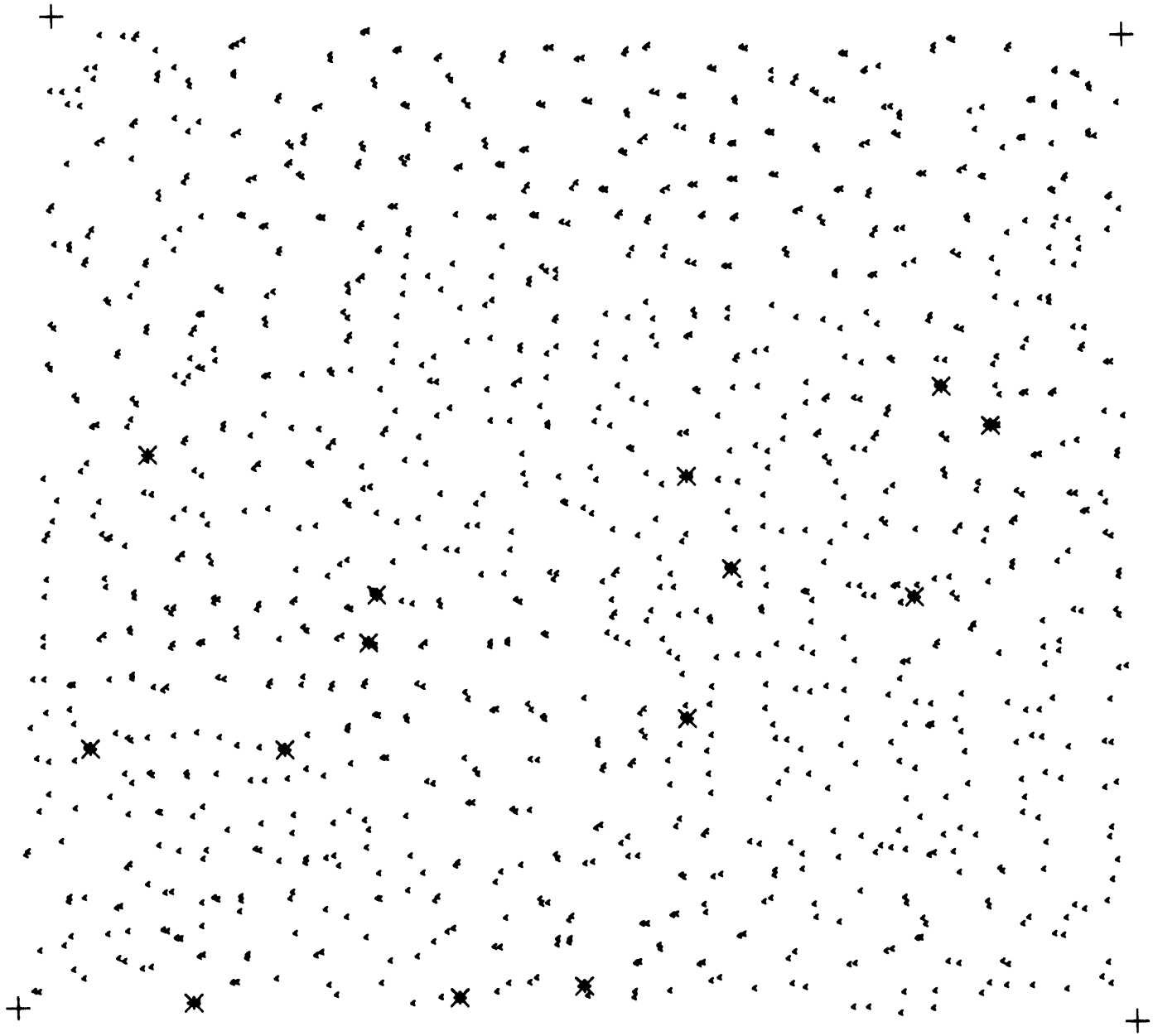
U IN SEDIMENTS

TABLE MOUNTAIN, ALASKA



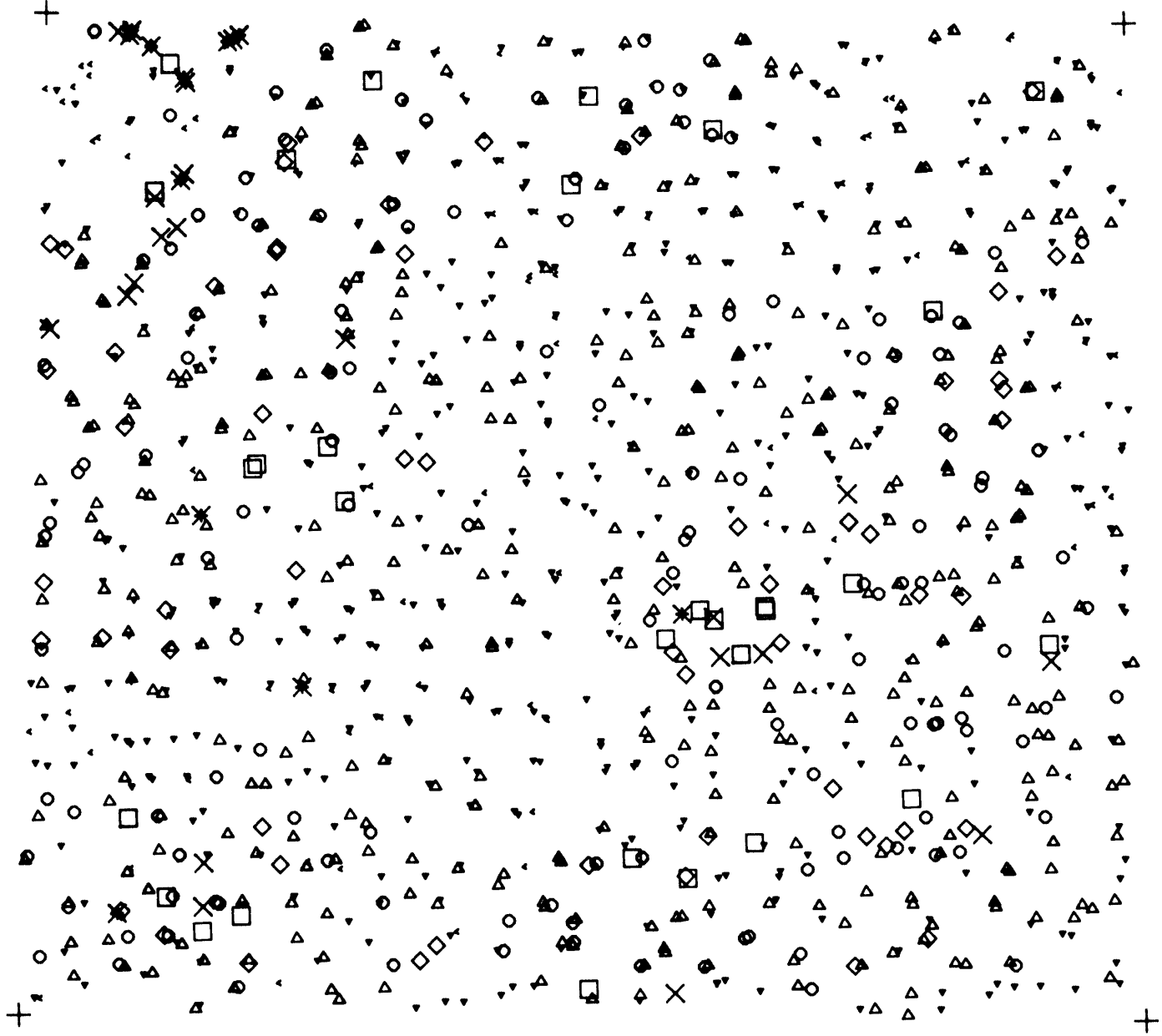
BI IN SEDIMENTS

TABLE MOUNTAIN, ALASKA



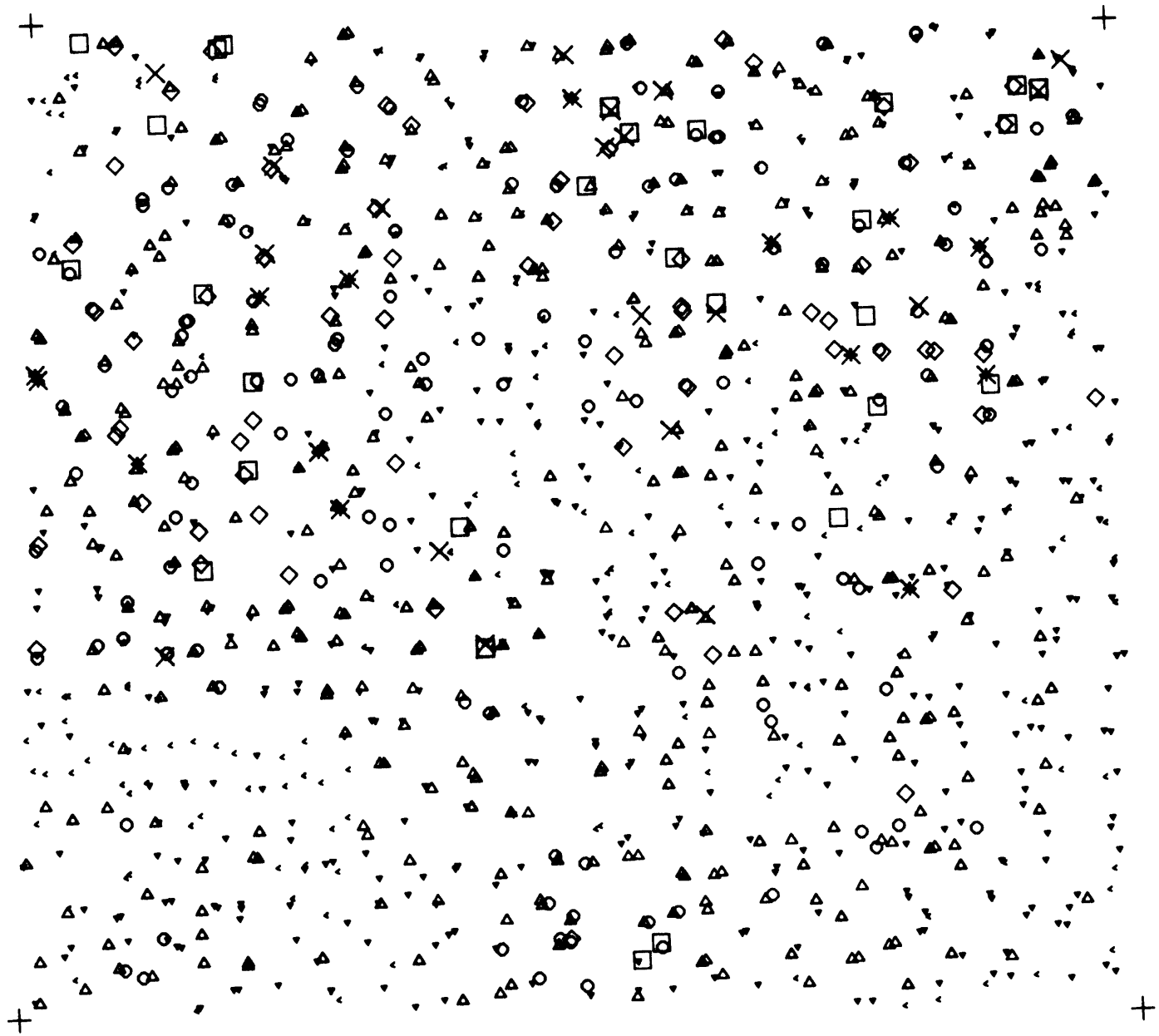
Cd IN SEDIMENTS

TABLE MOUNTAIN, ALASKA



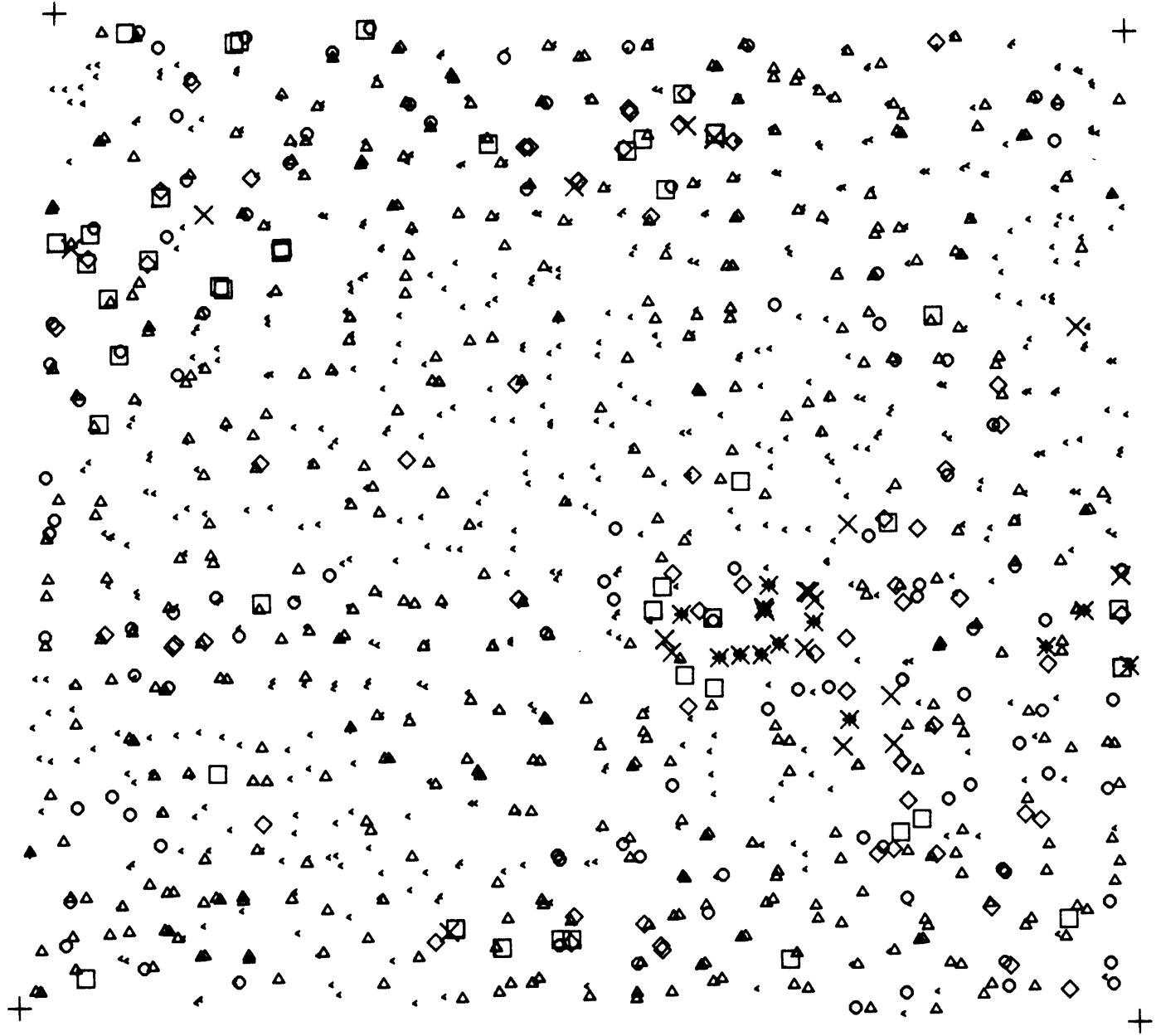
Cu IN SEDIMENTS

TABLE MOUNTAIN, ALASKA



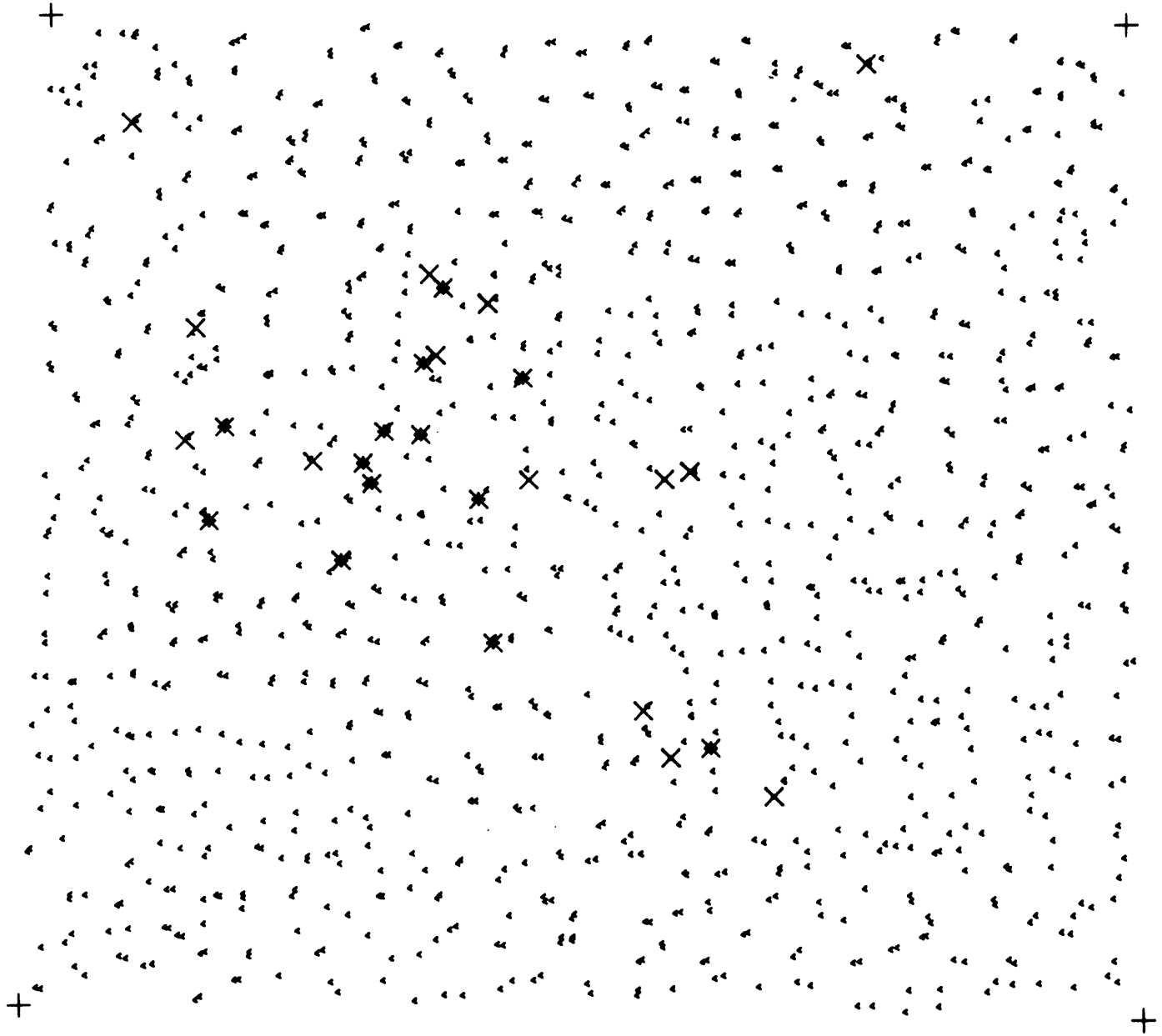
NI IN SEDIMENTS

TABLE MOUNTAIN, ALASKA



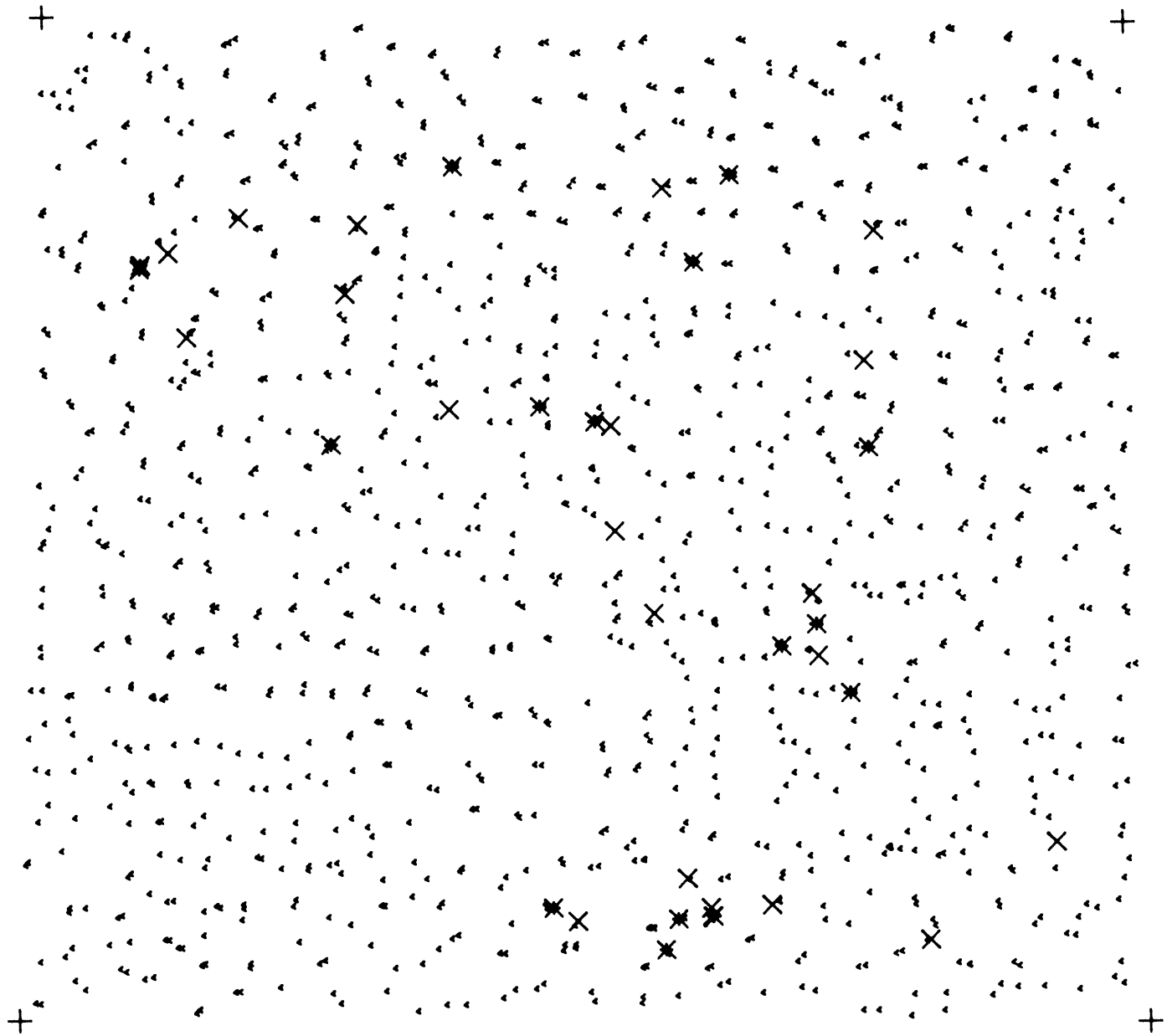
Pb IN SEDIMENTS

TABLE MOUNTAIN, ALASKA



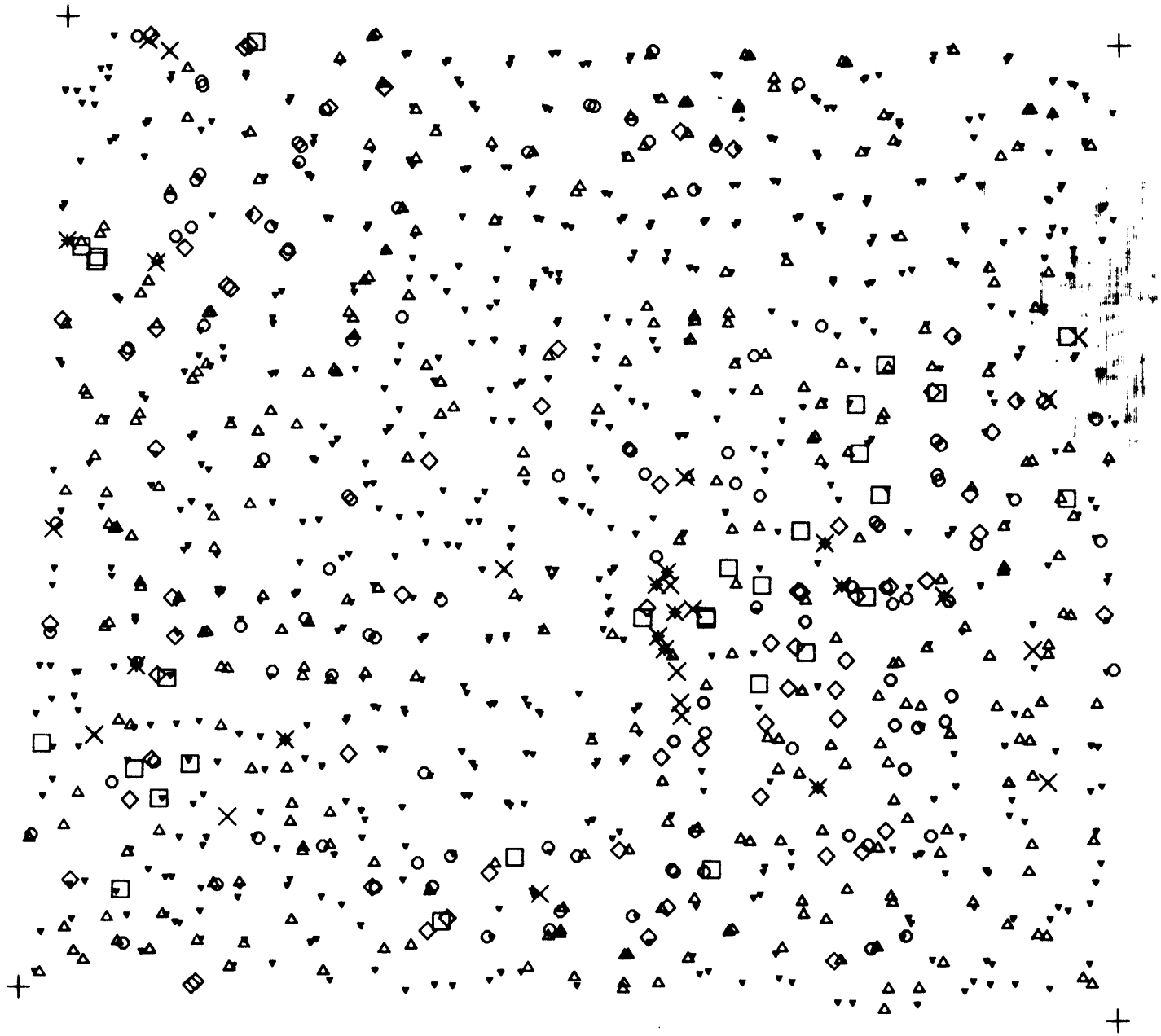
Sn IN SEDIMENTS

TABLE MOUNTAIN, ALASKA



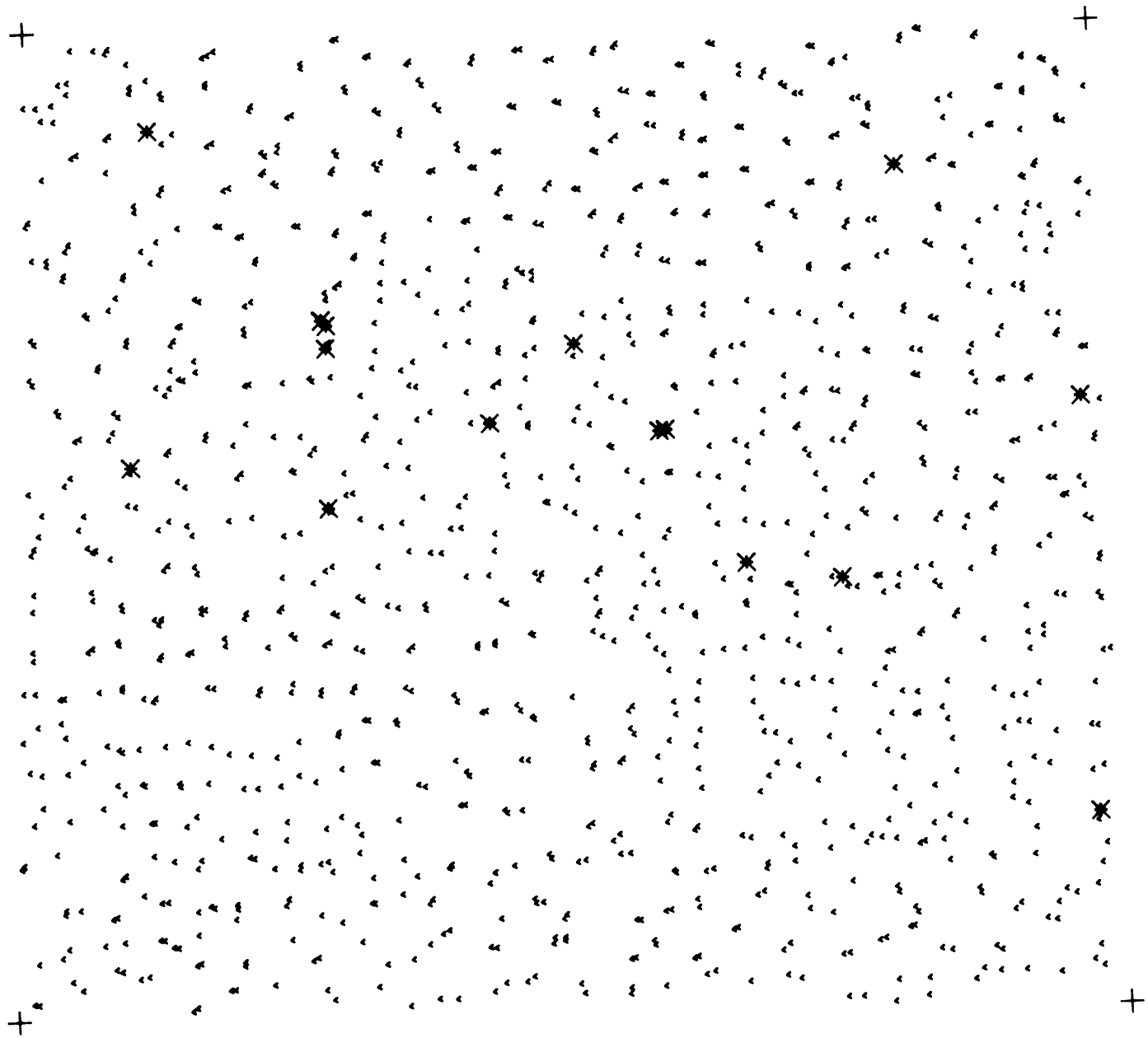
W IN SEDIMENTS

TABLE MOUNTAIN, ALASKA



As IN SEDIMENTS

TABLE MOUNTAIN, ALASKA



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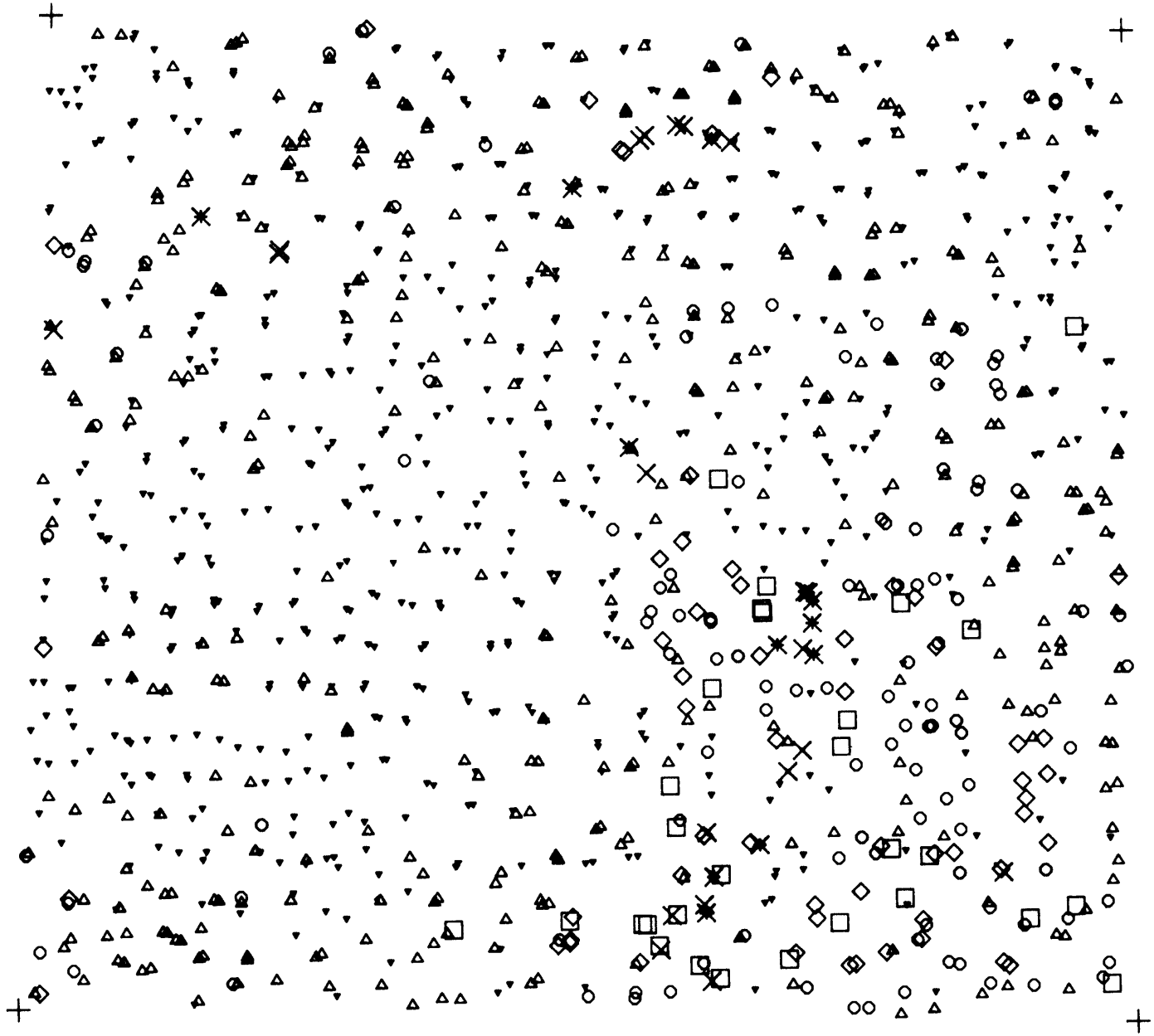

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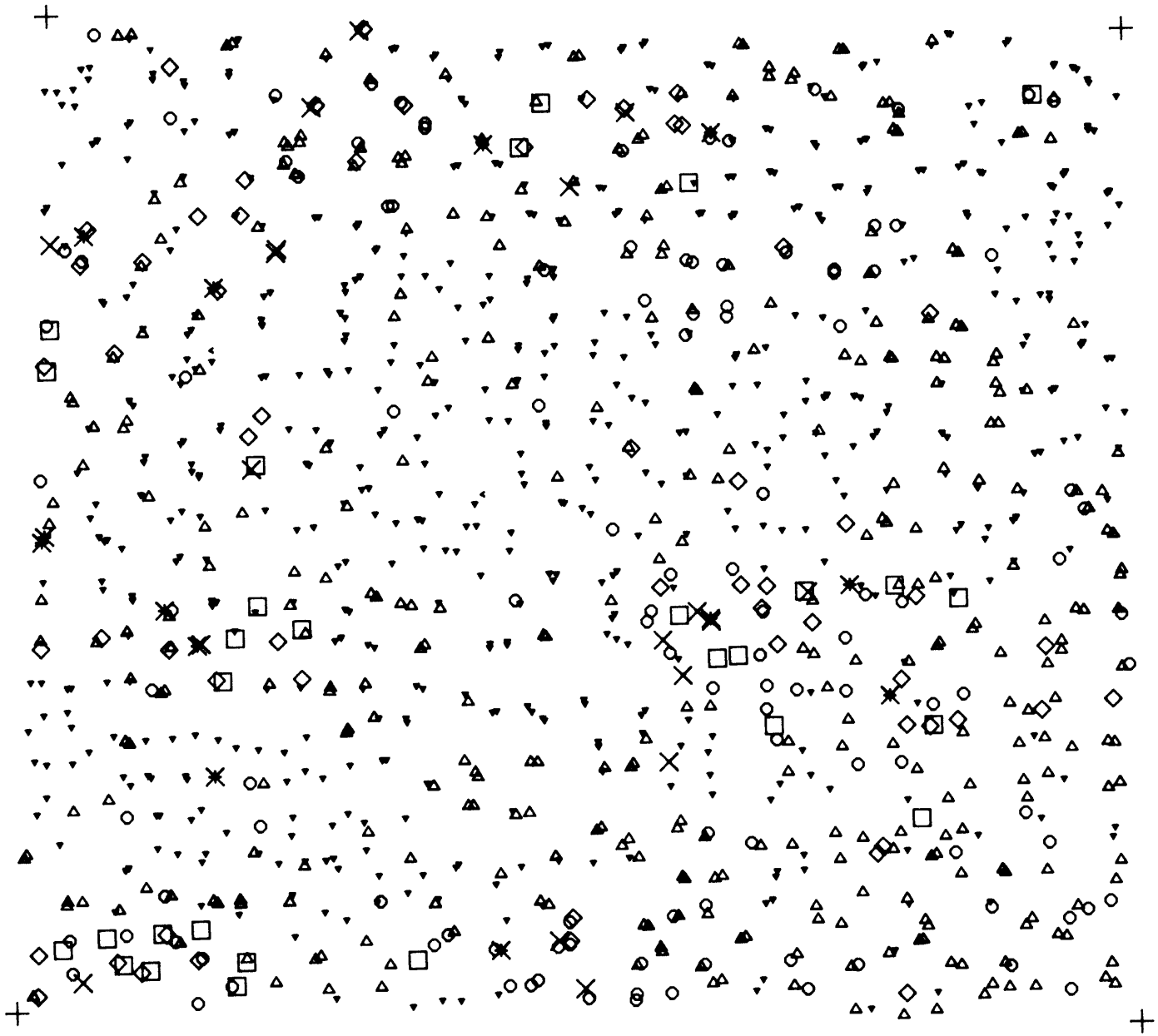

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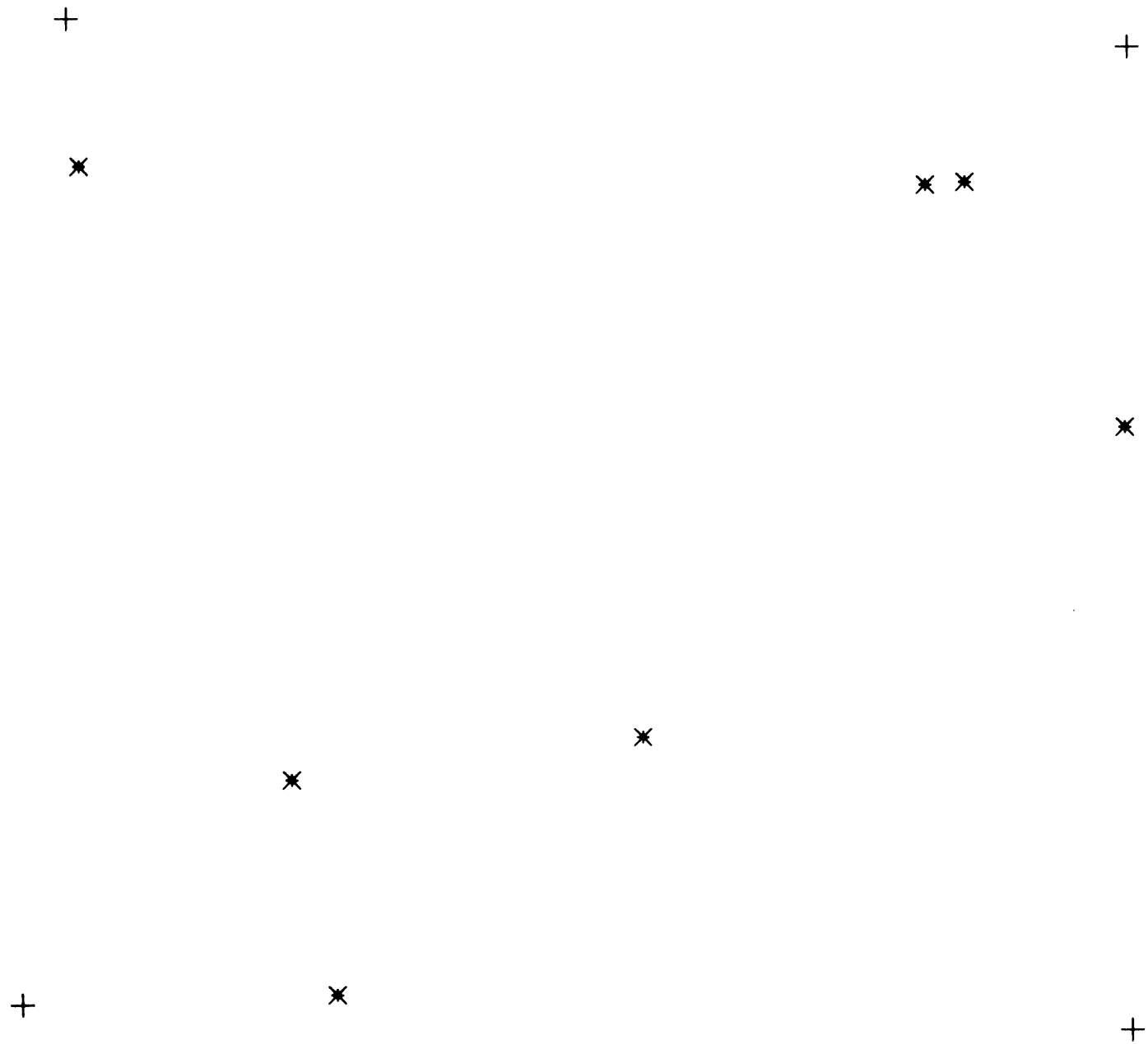

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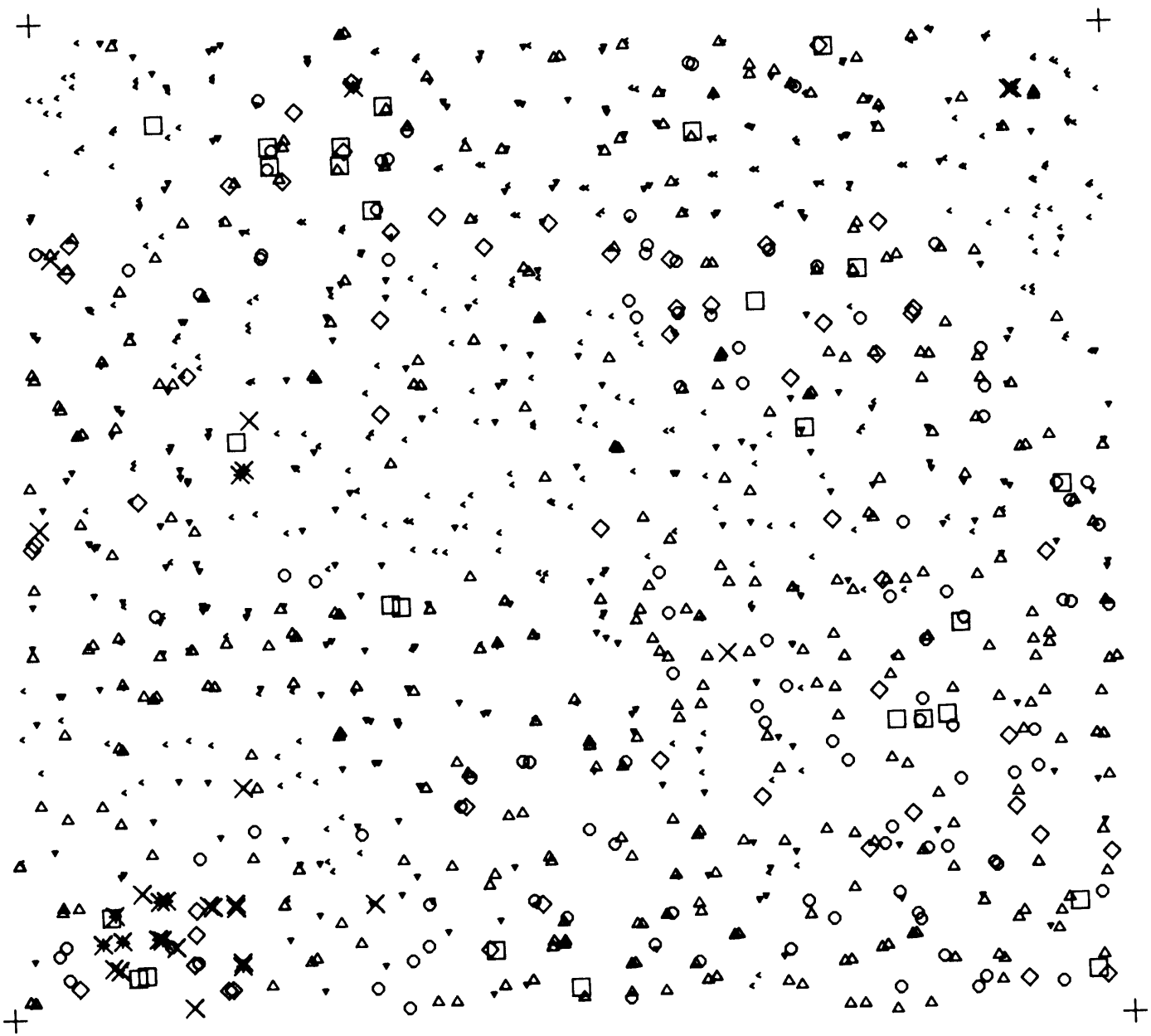

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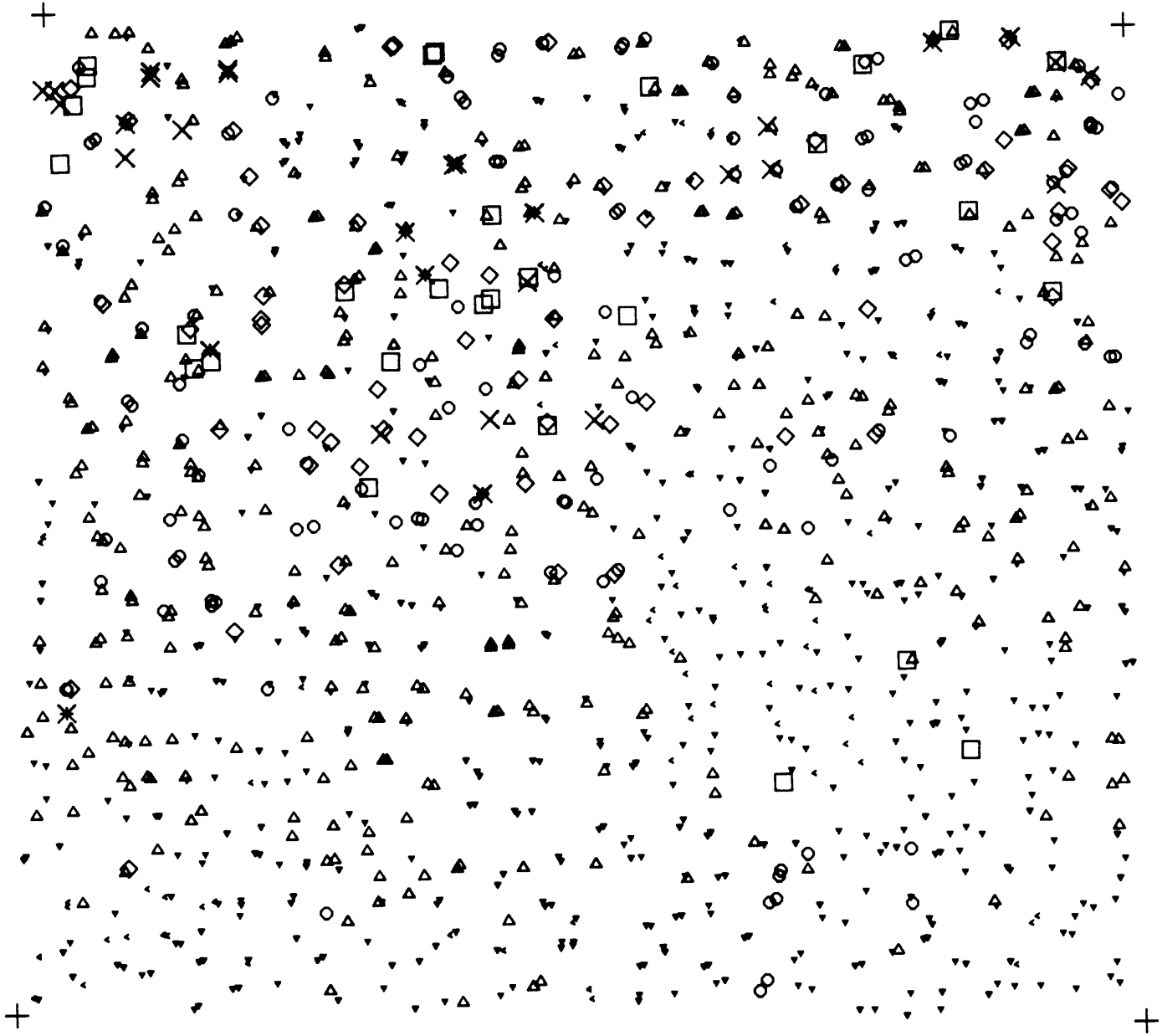

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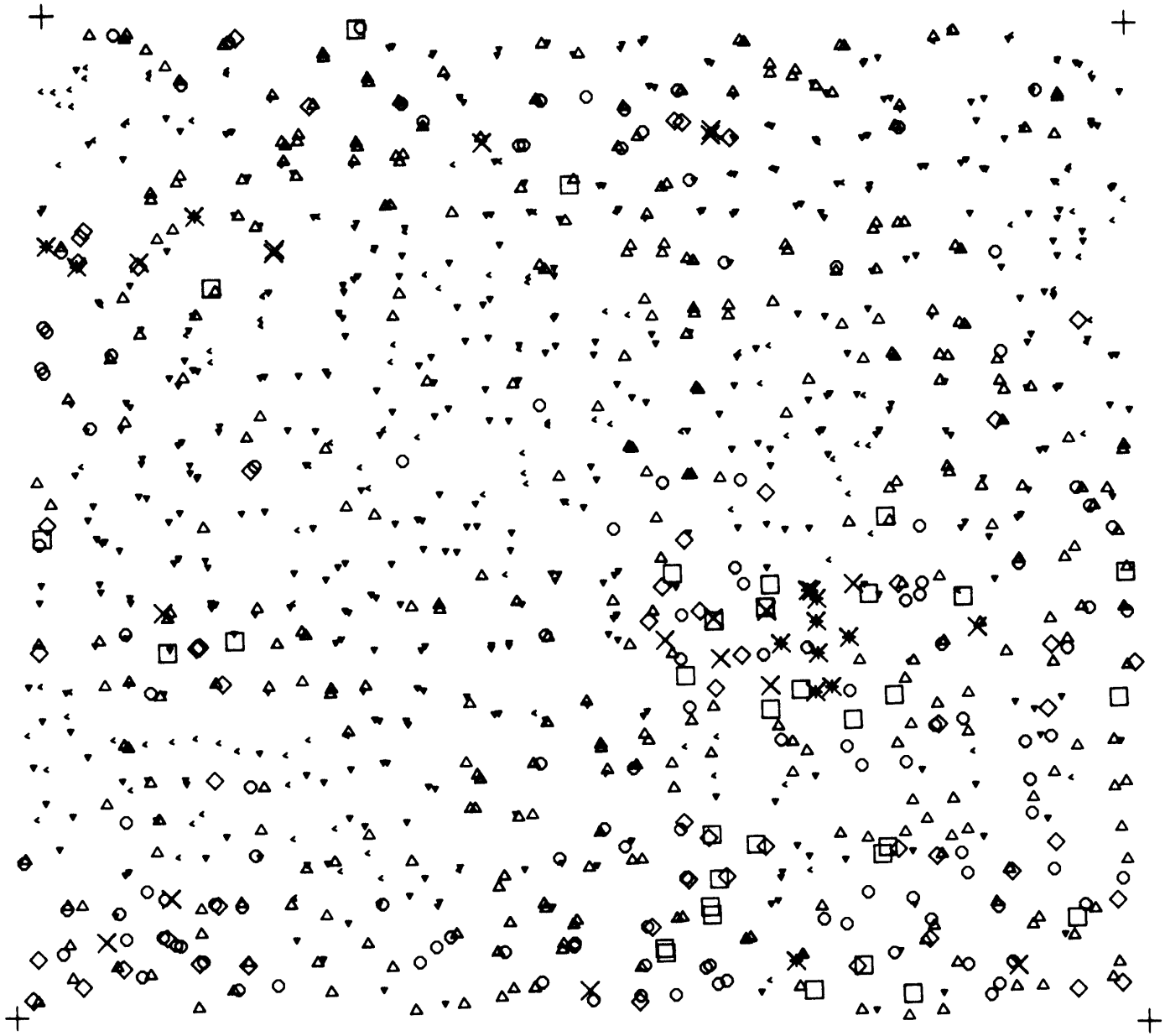

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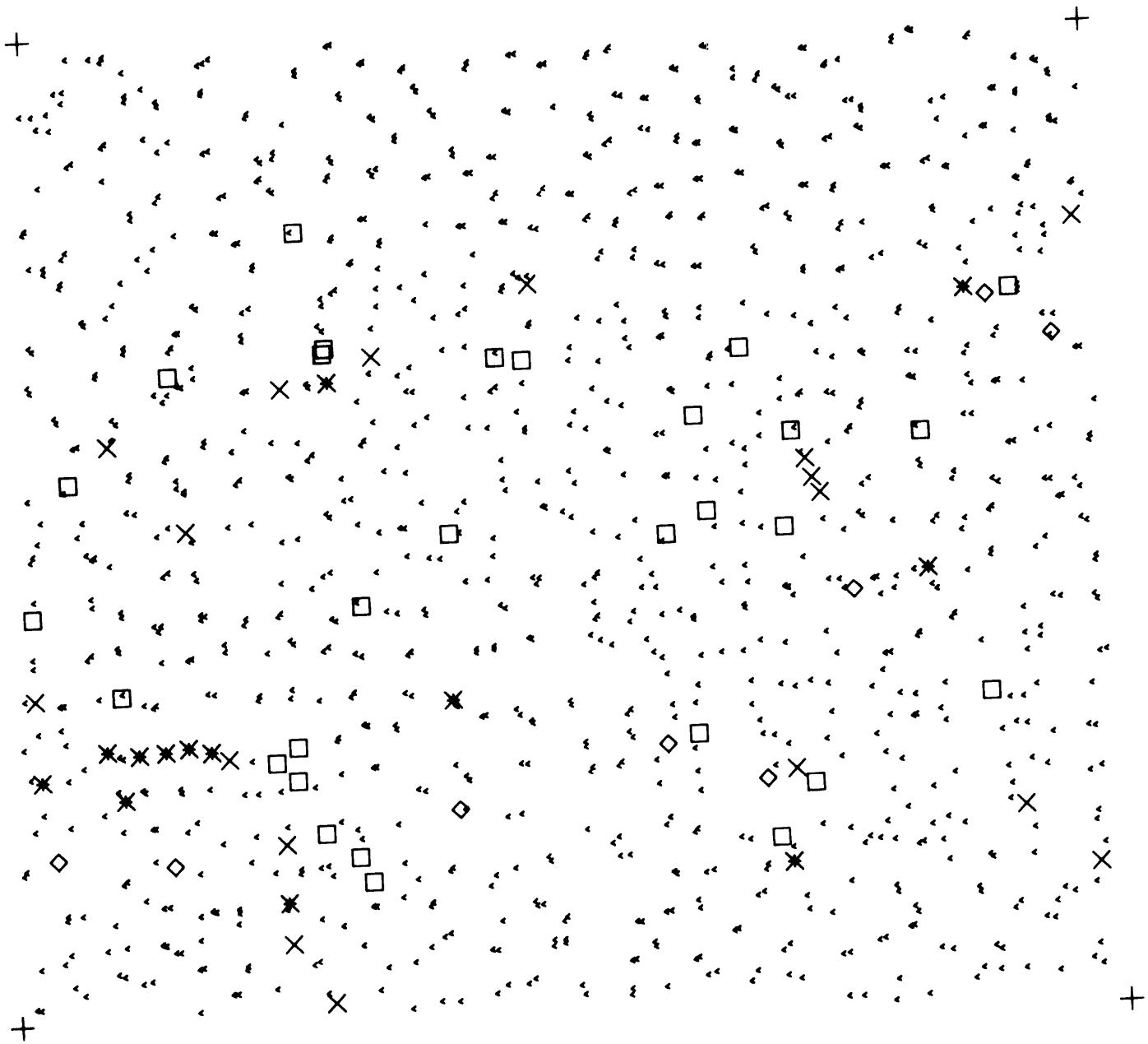

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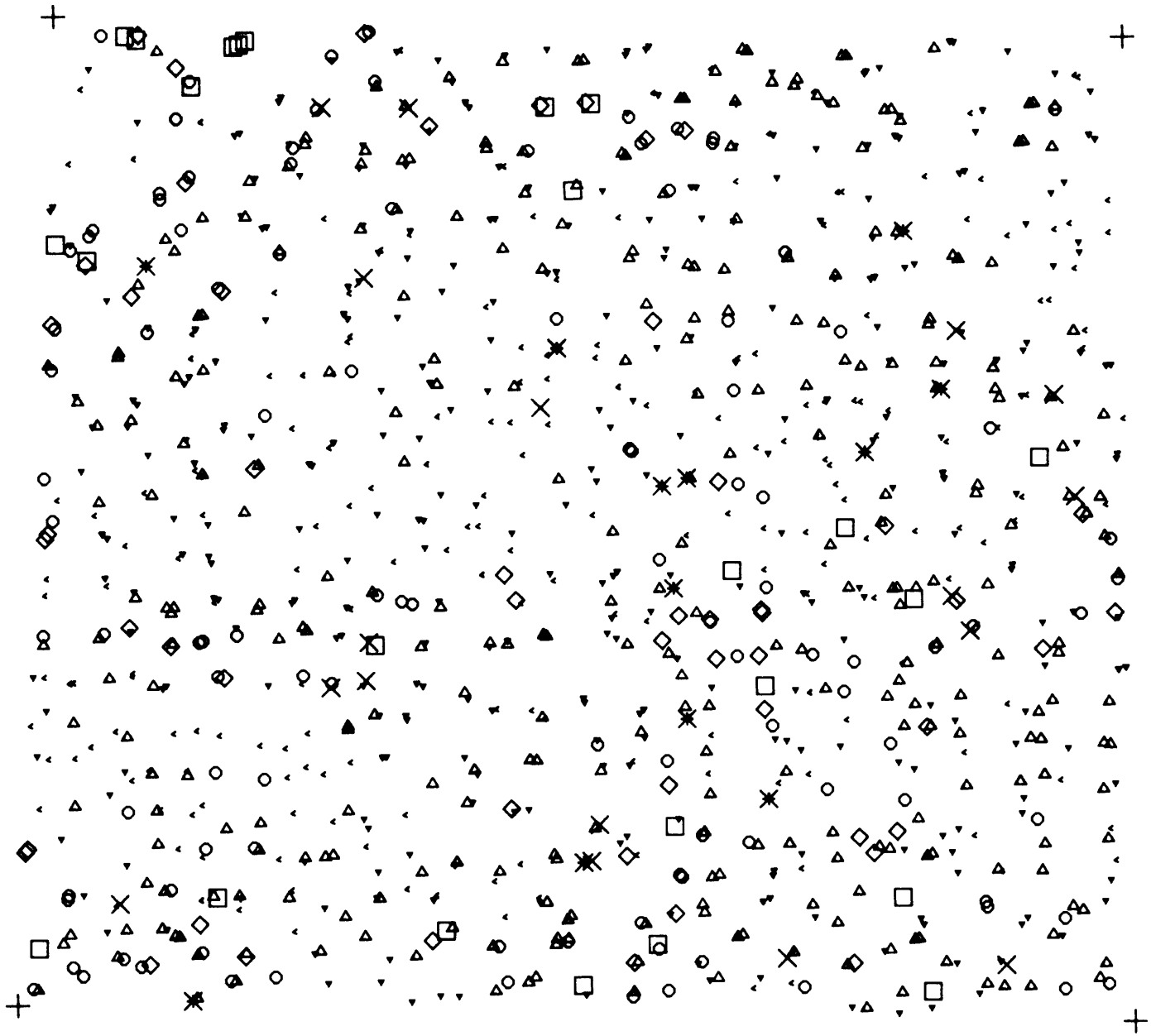

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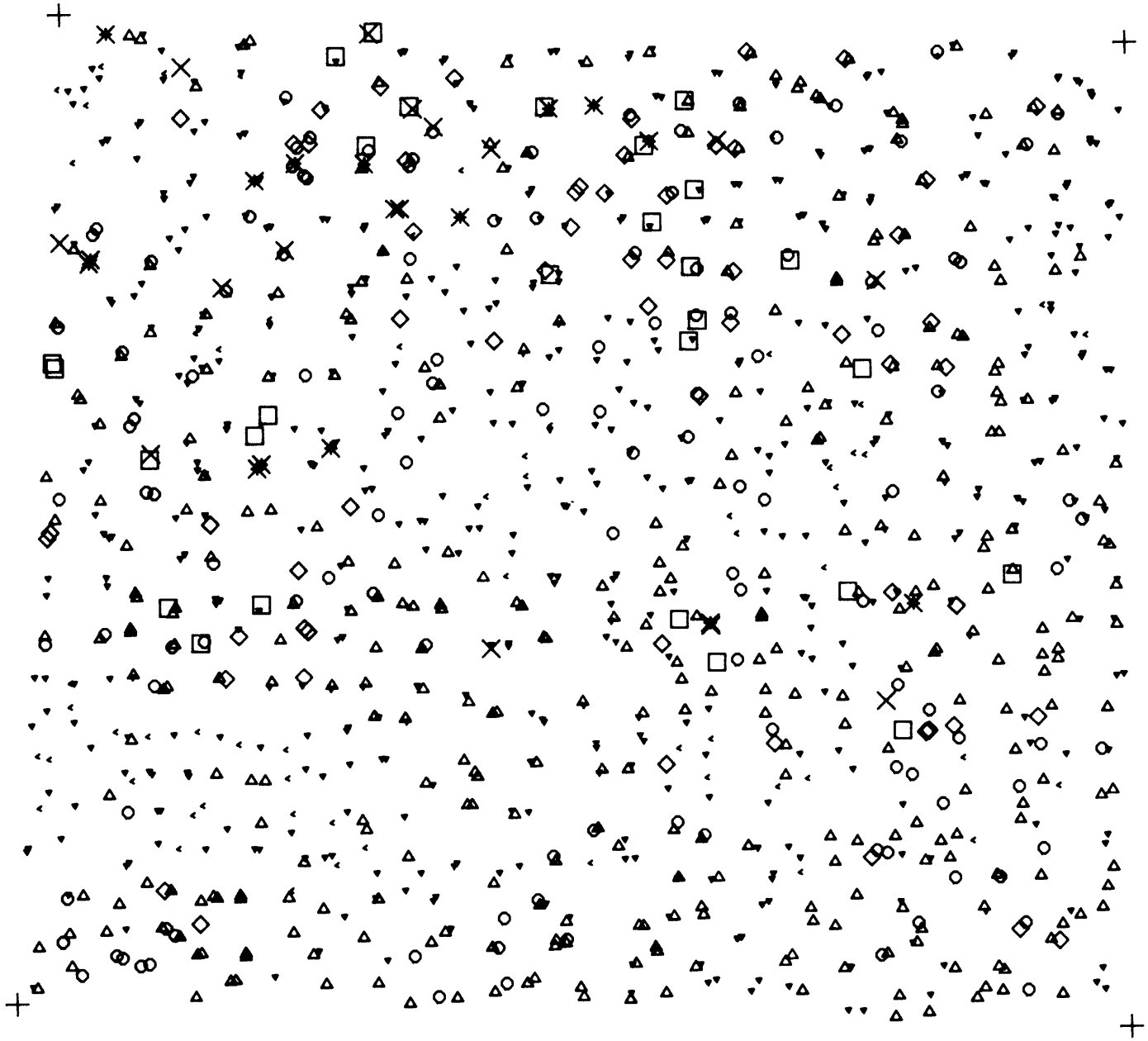

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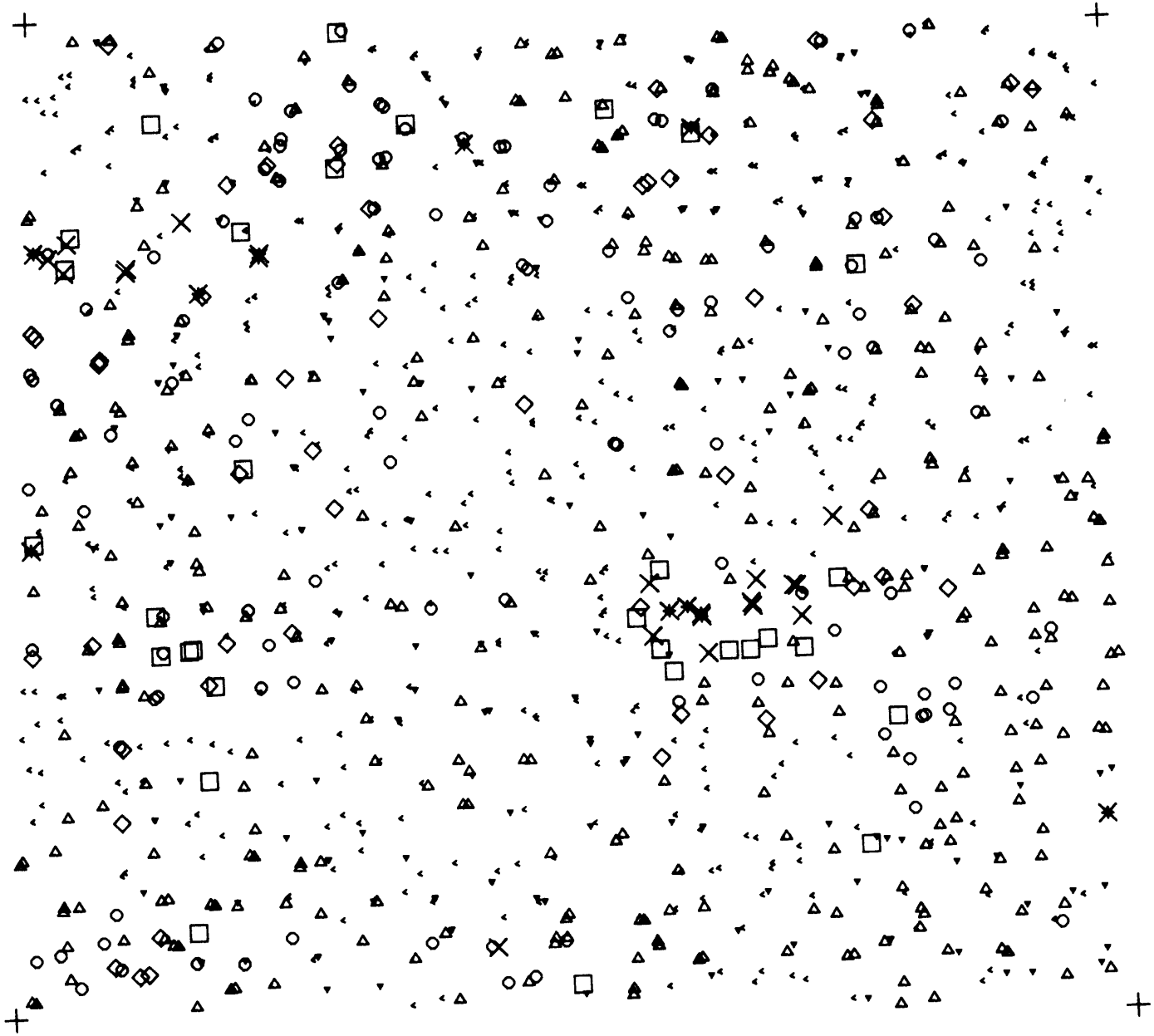

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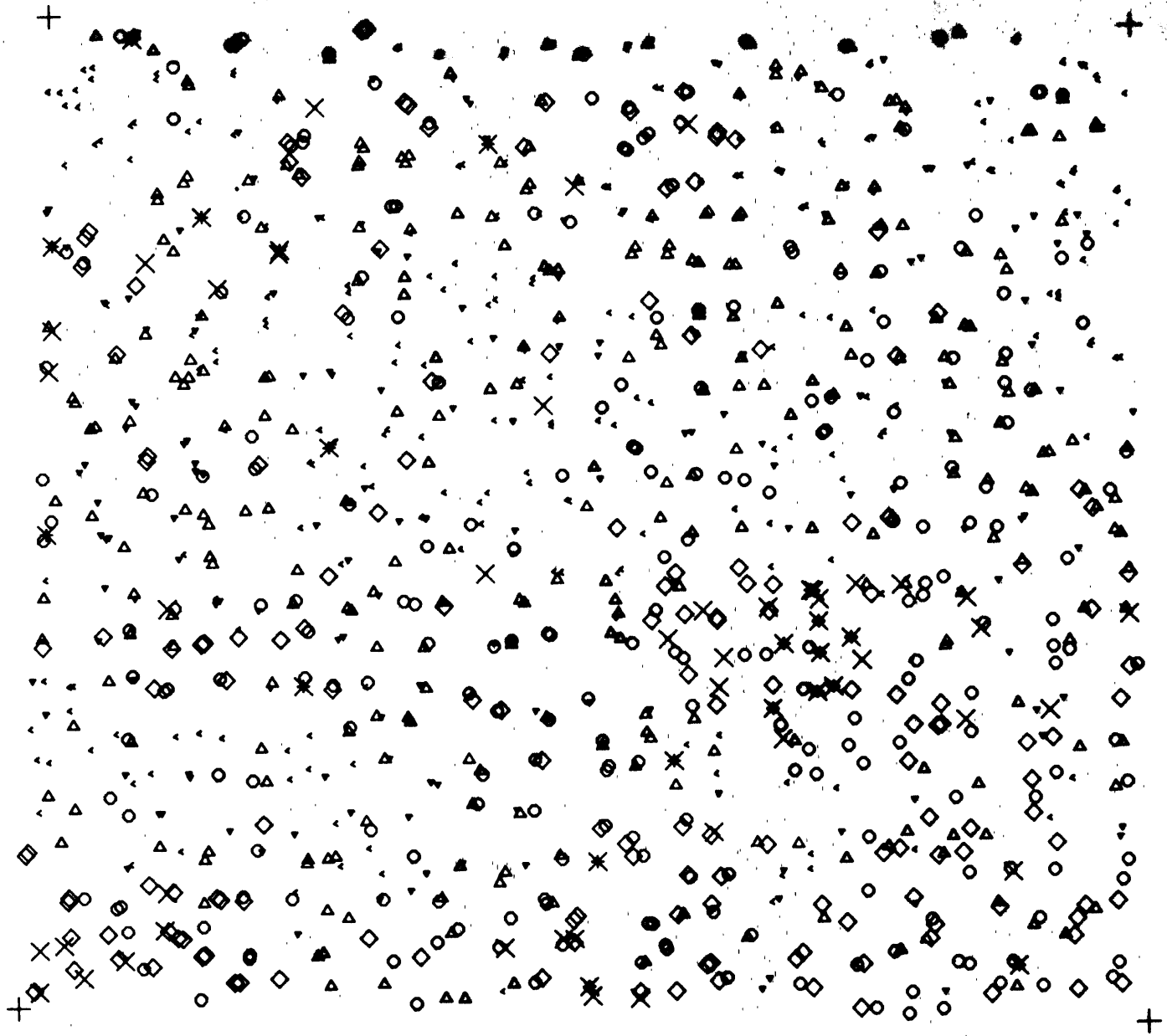

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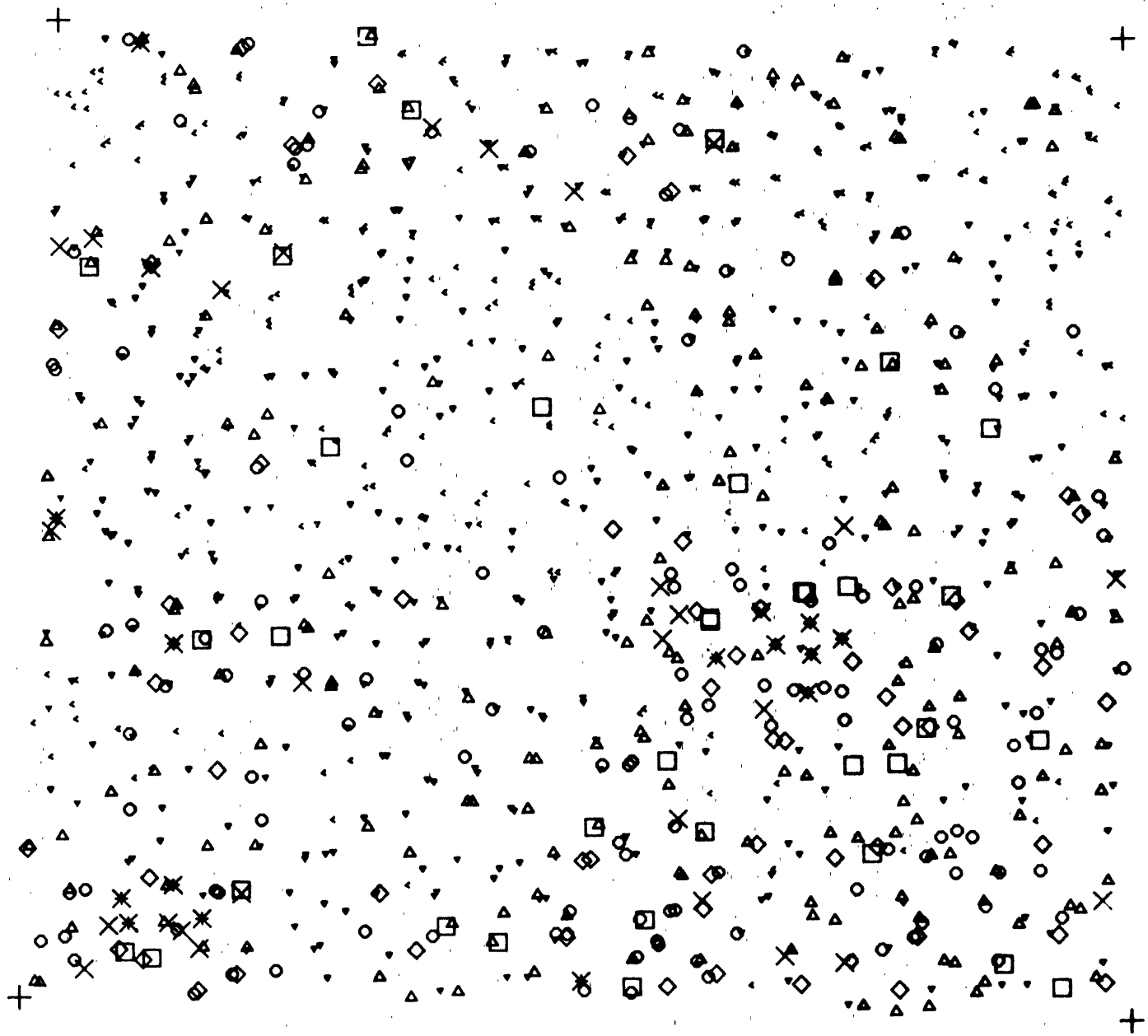

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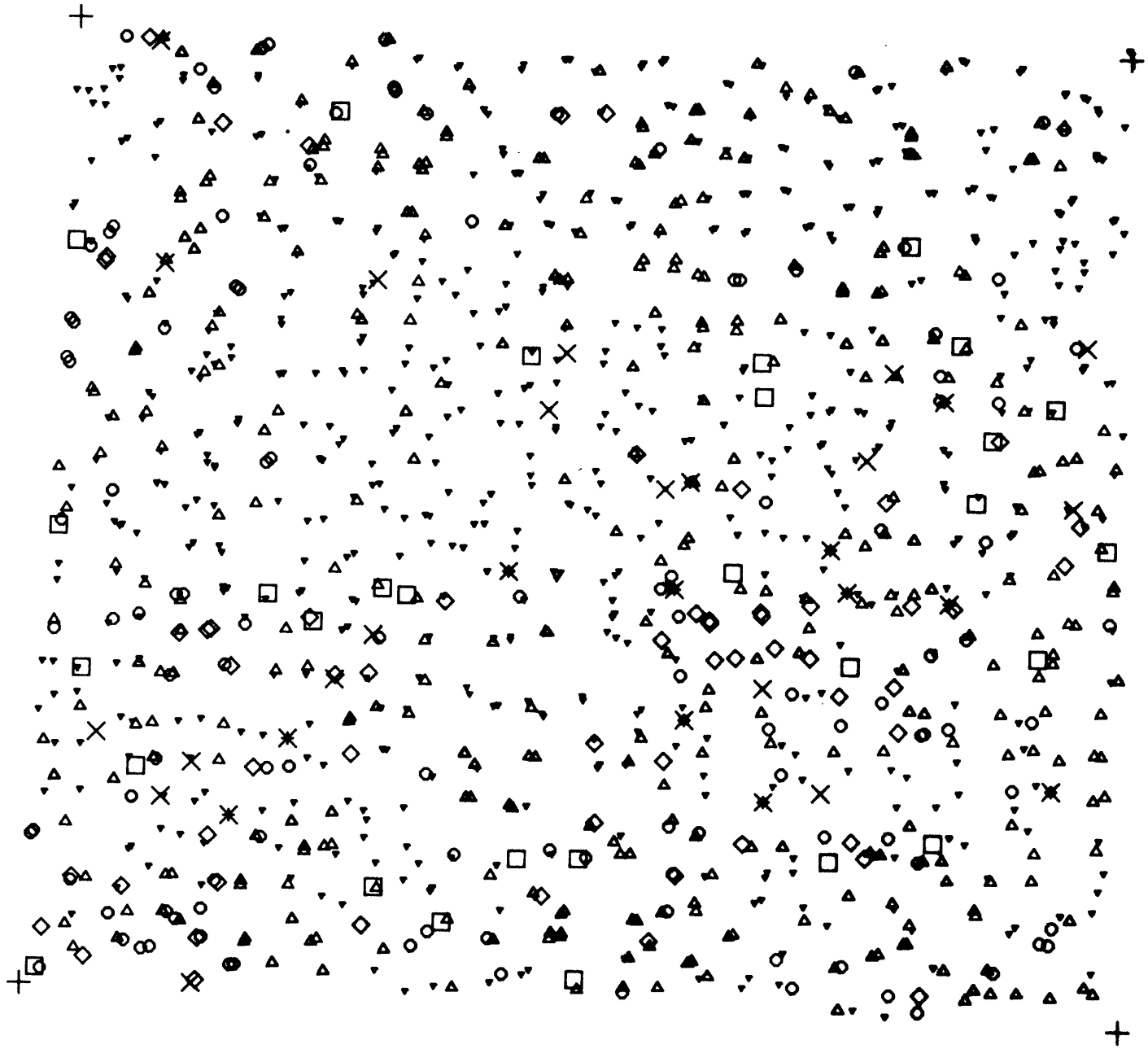

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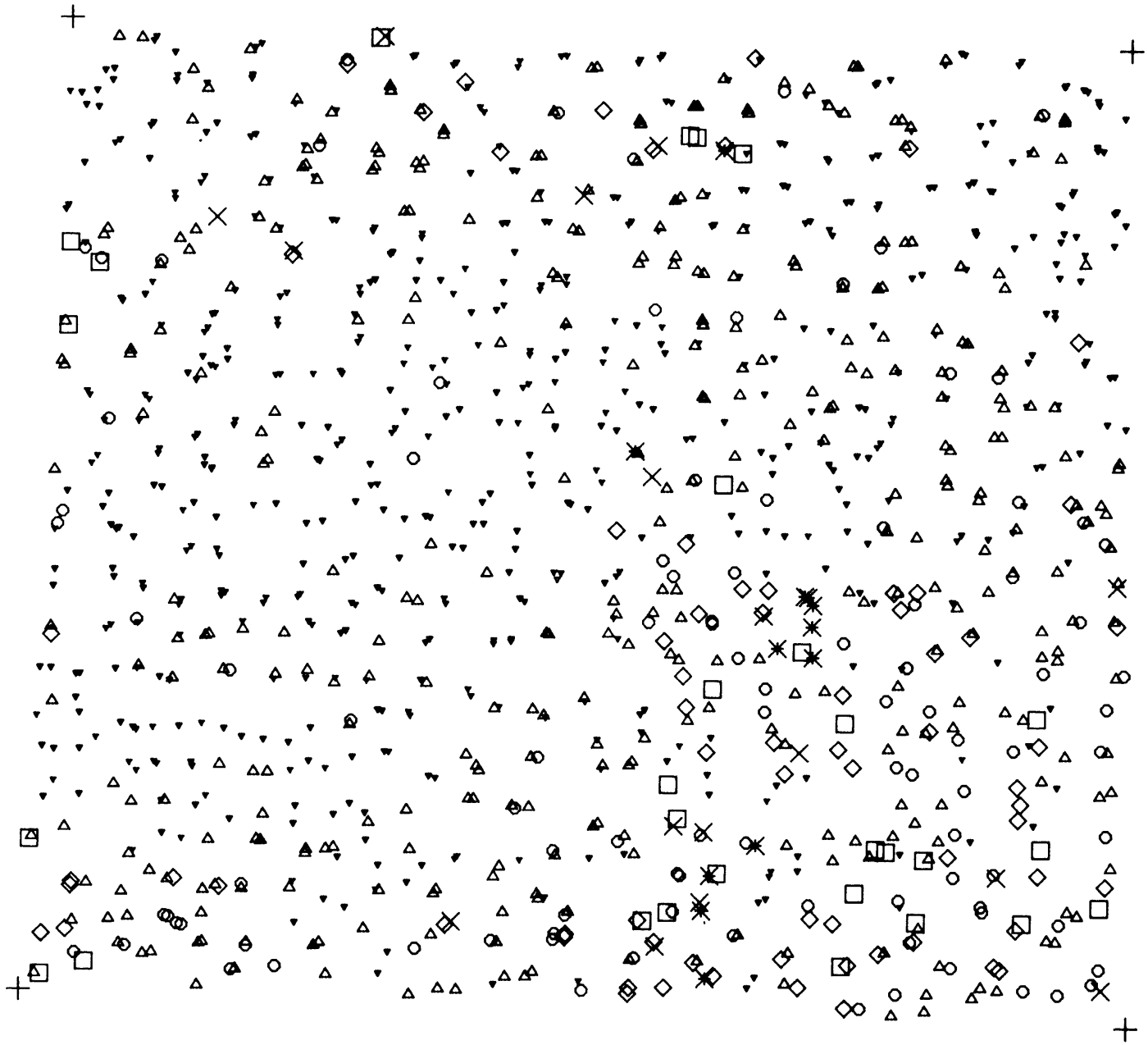

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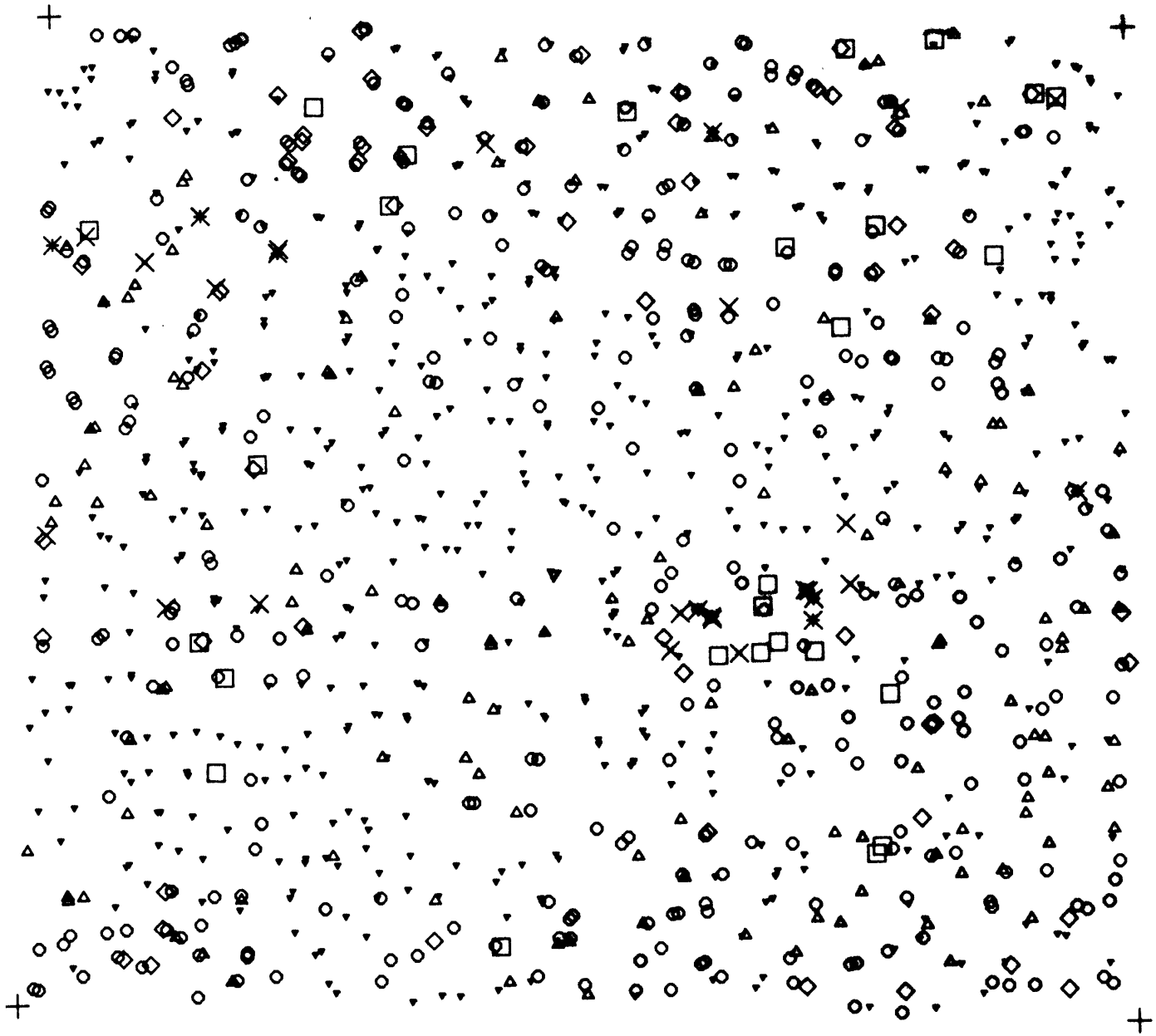

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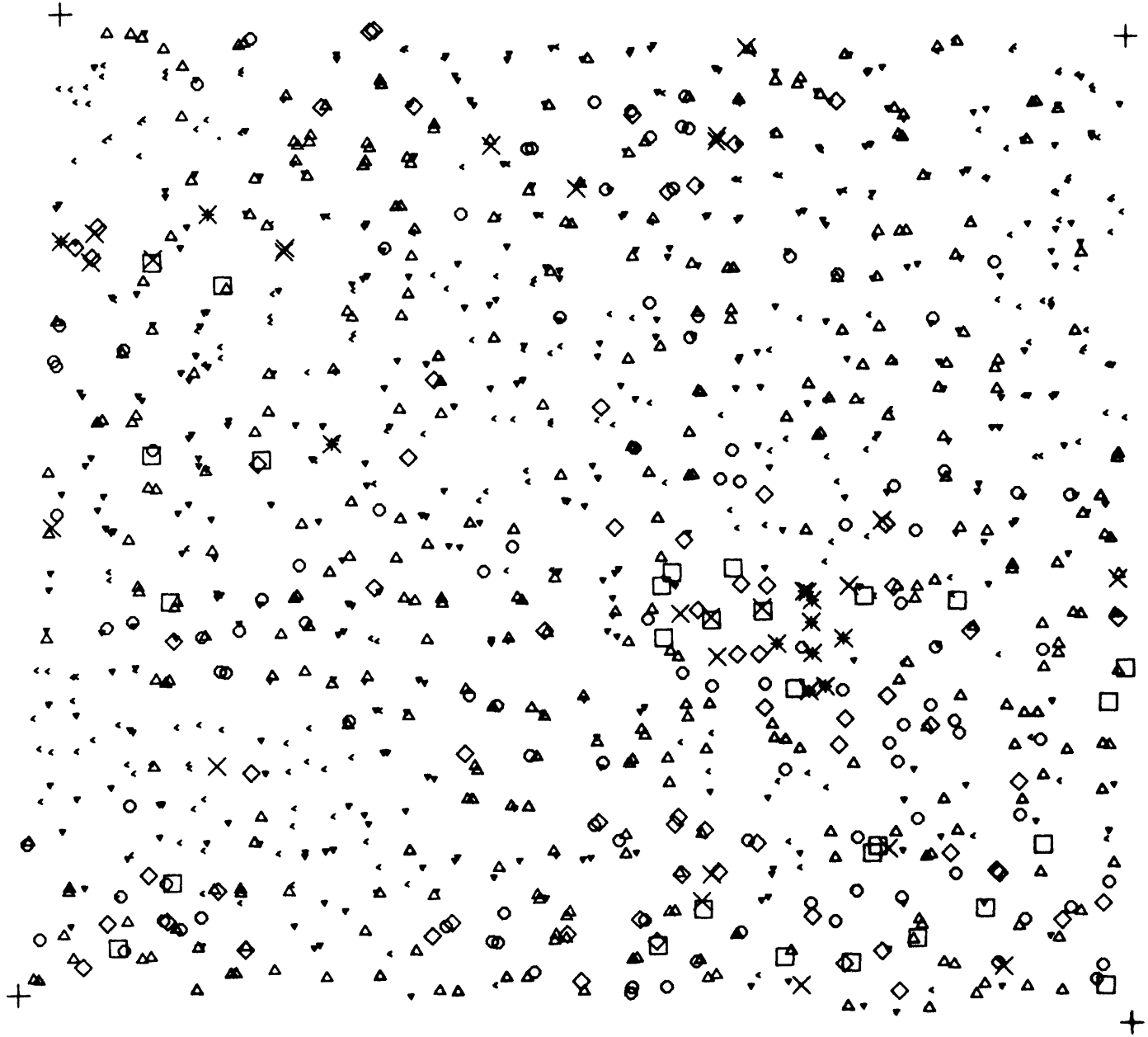

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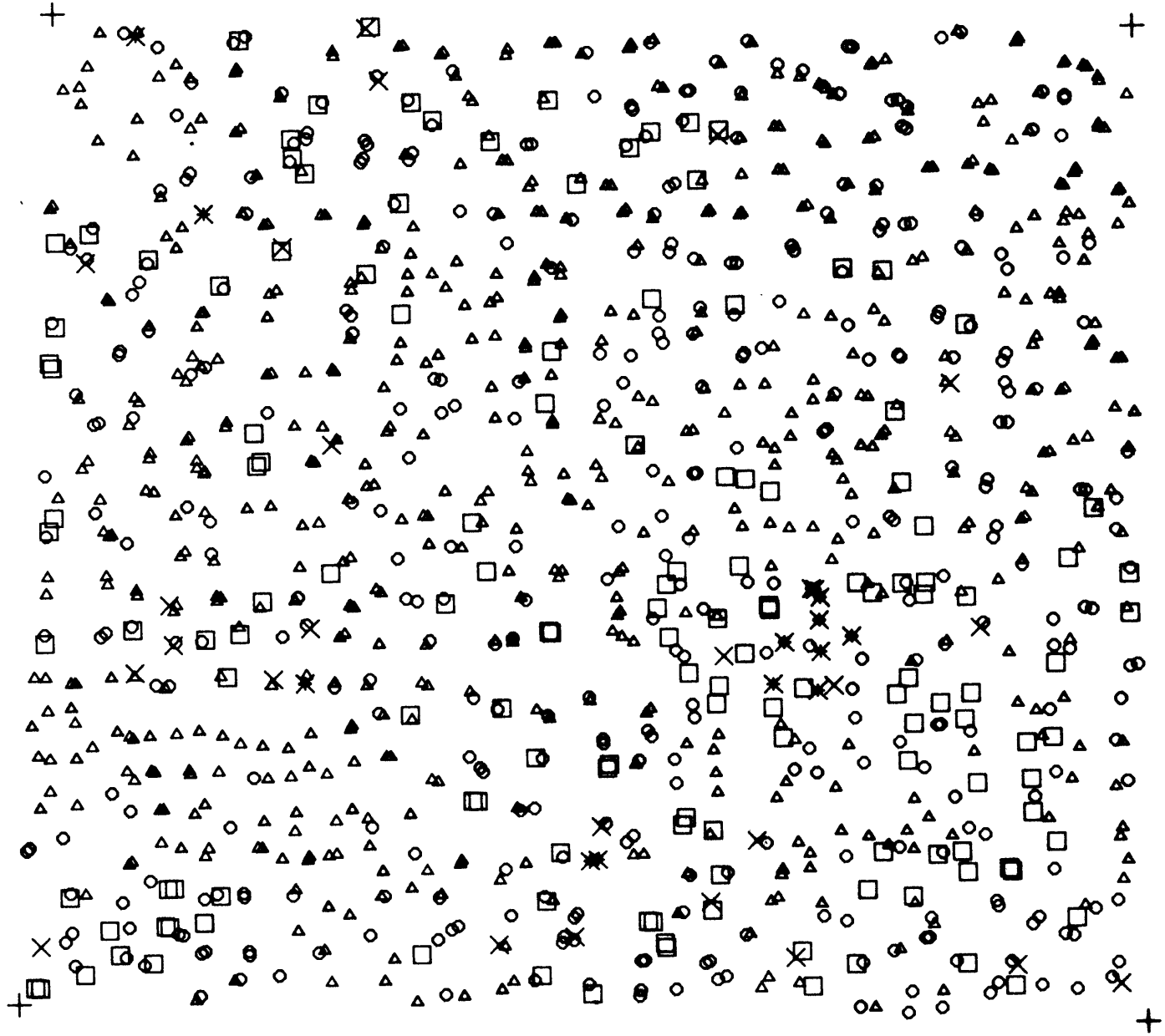

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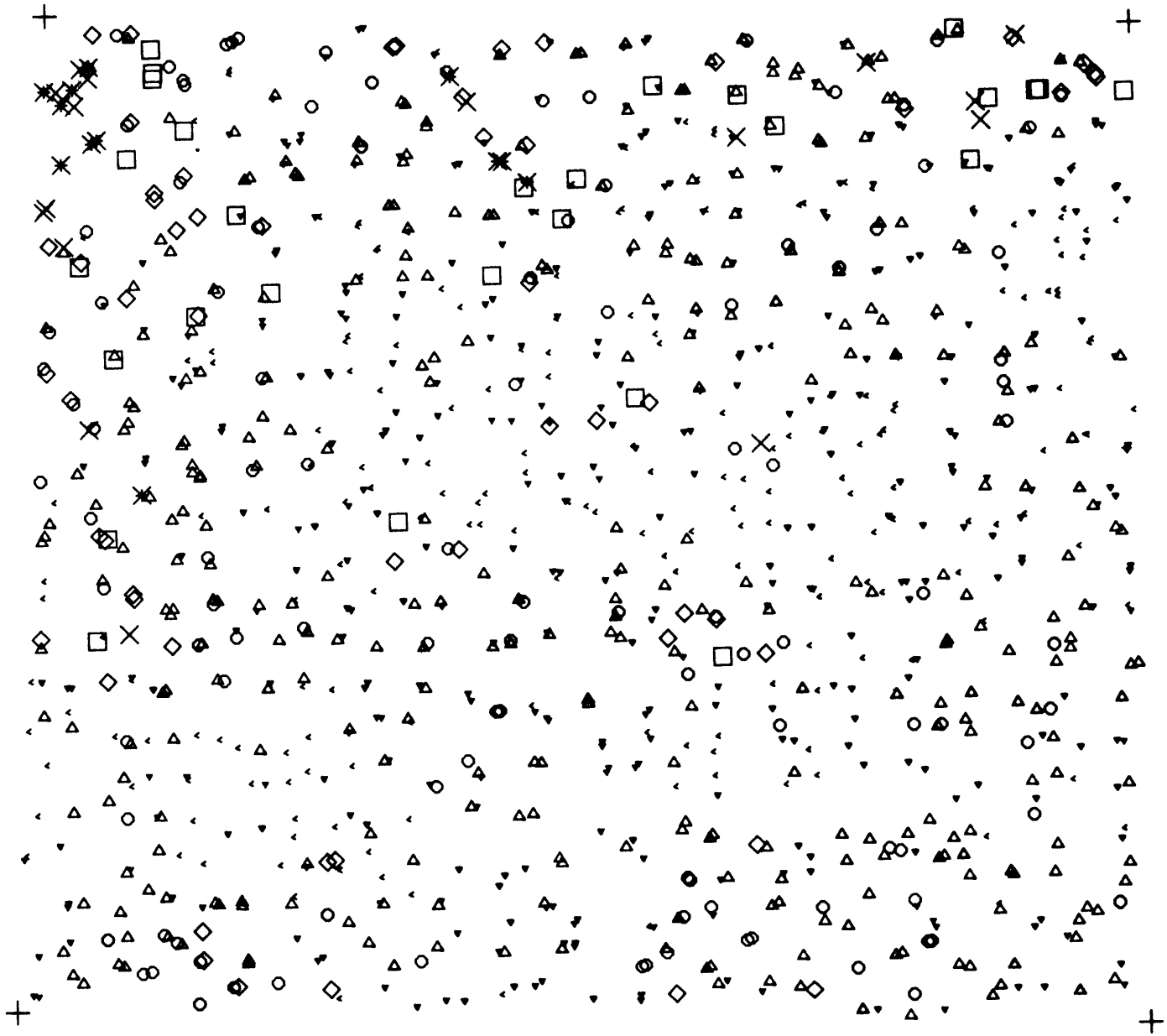

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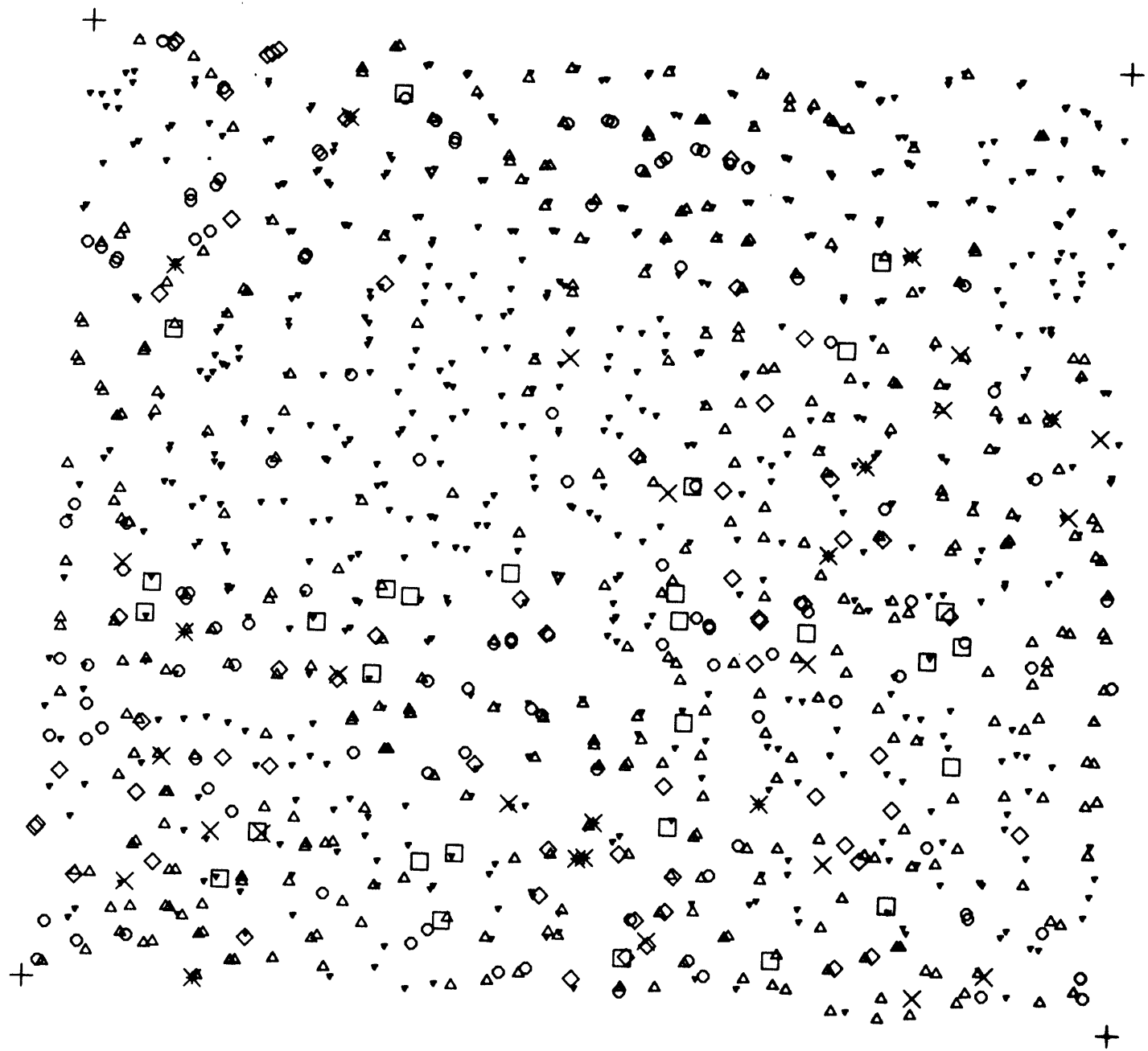

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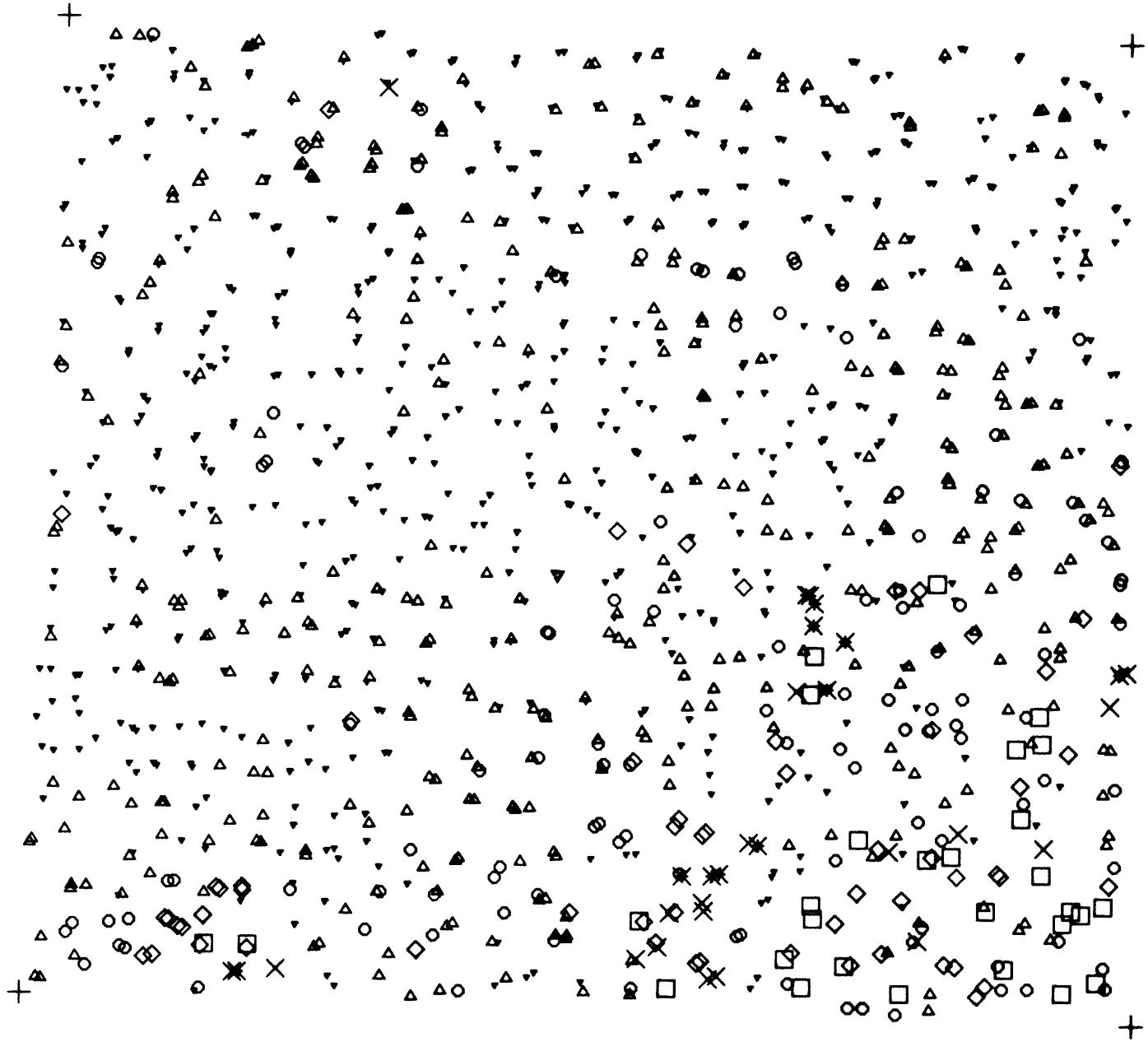

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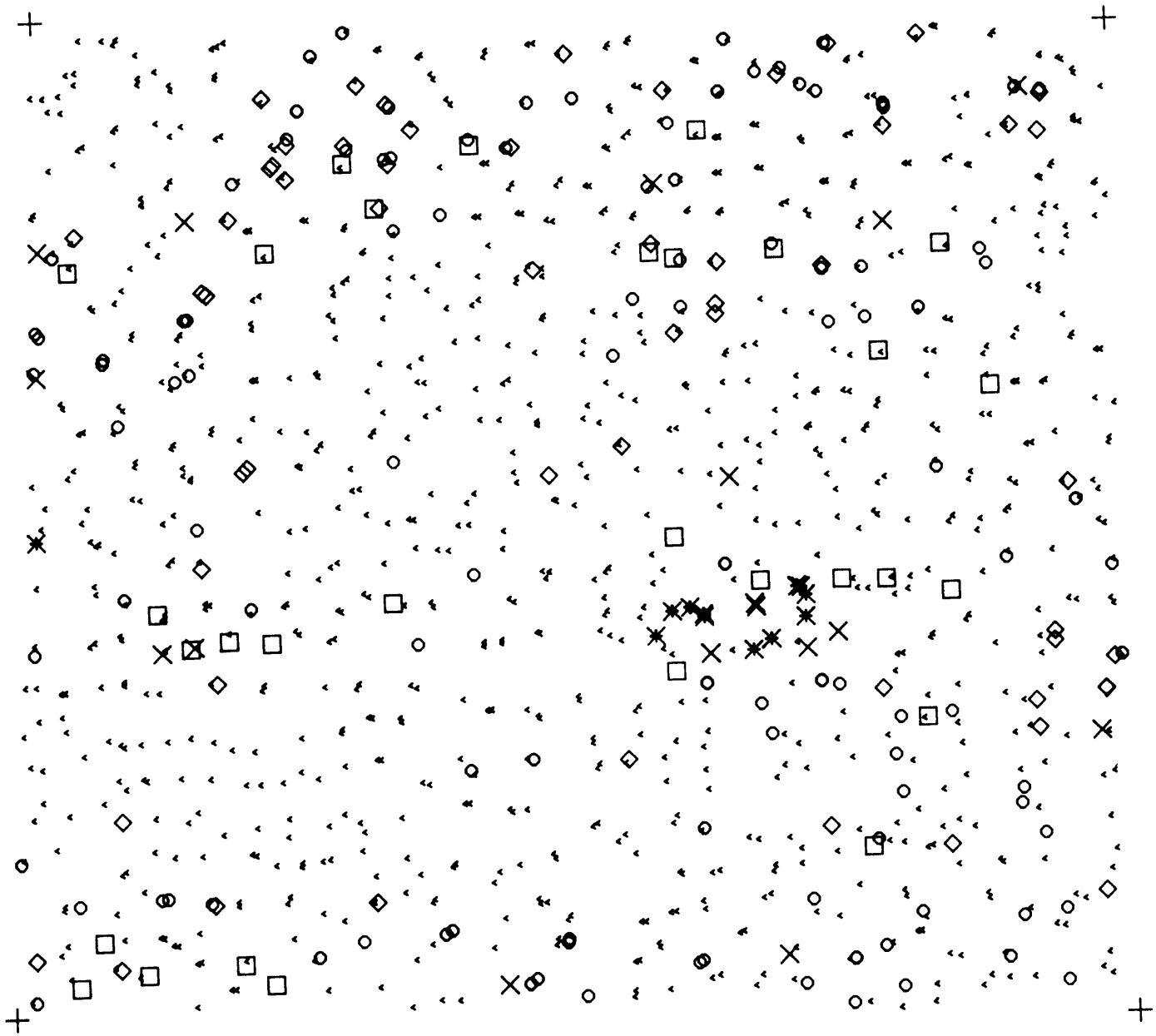

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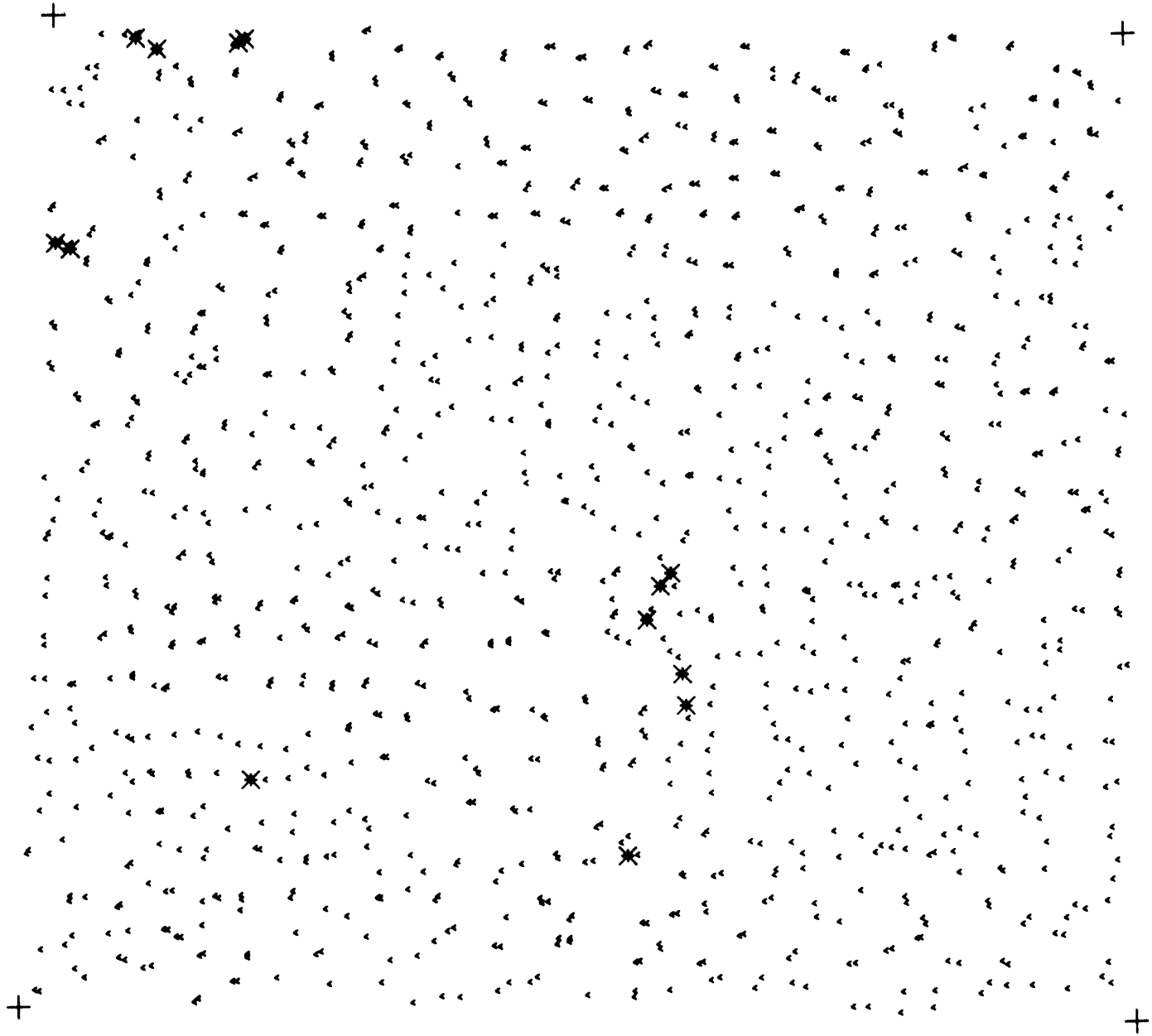

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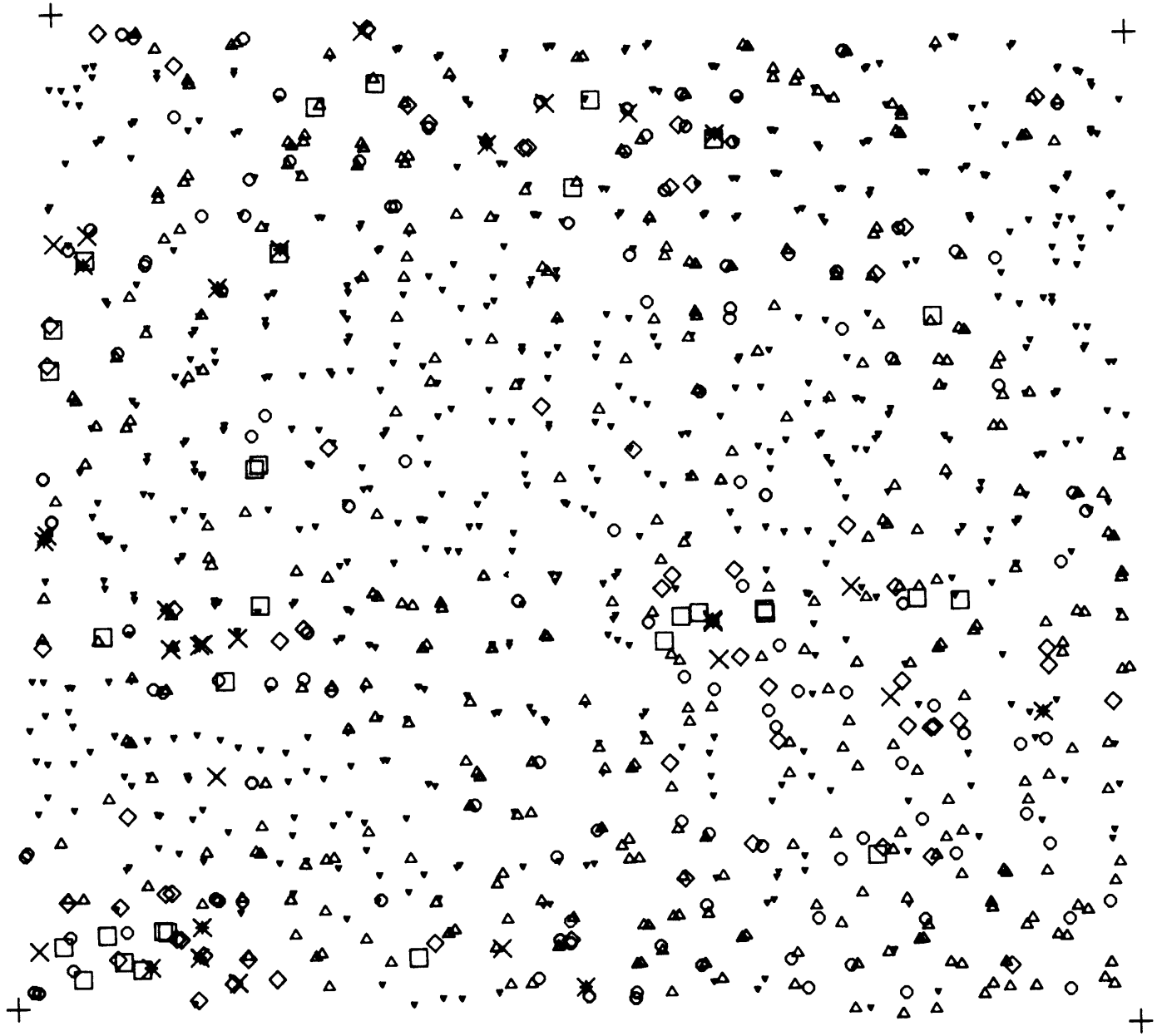

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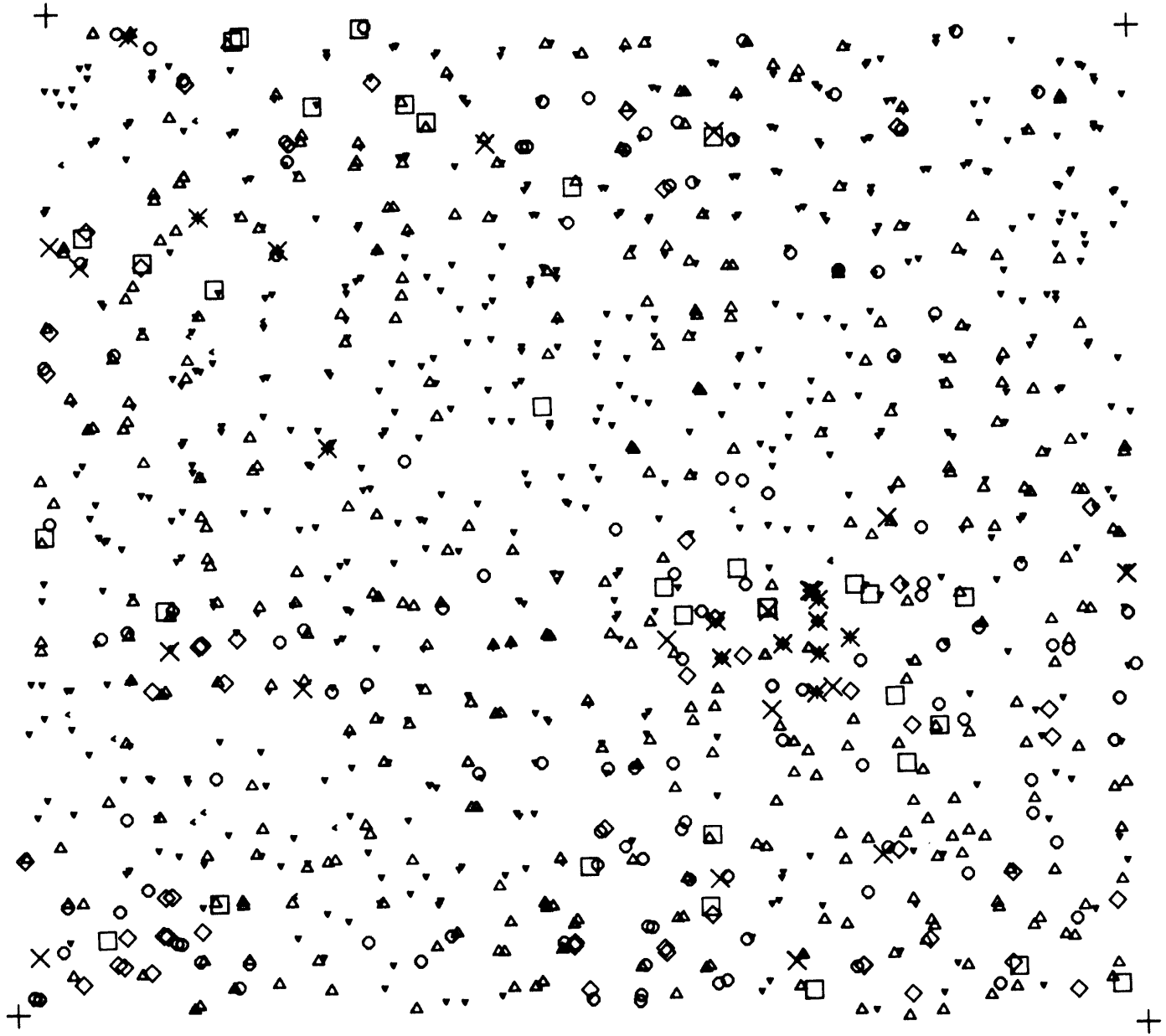

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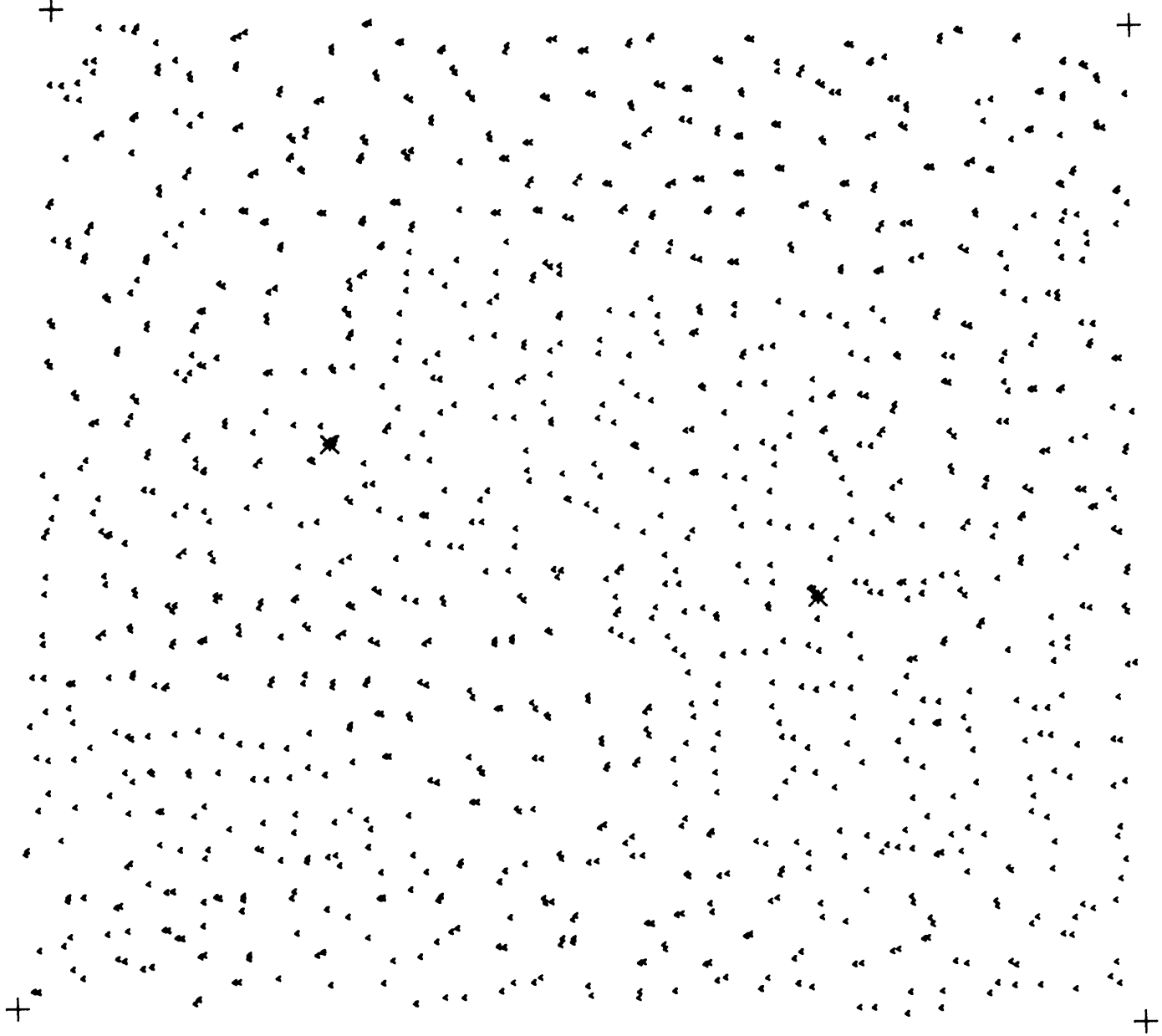

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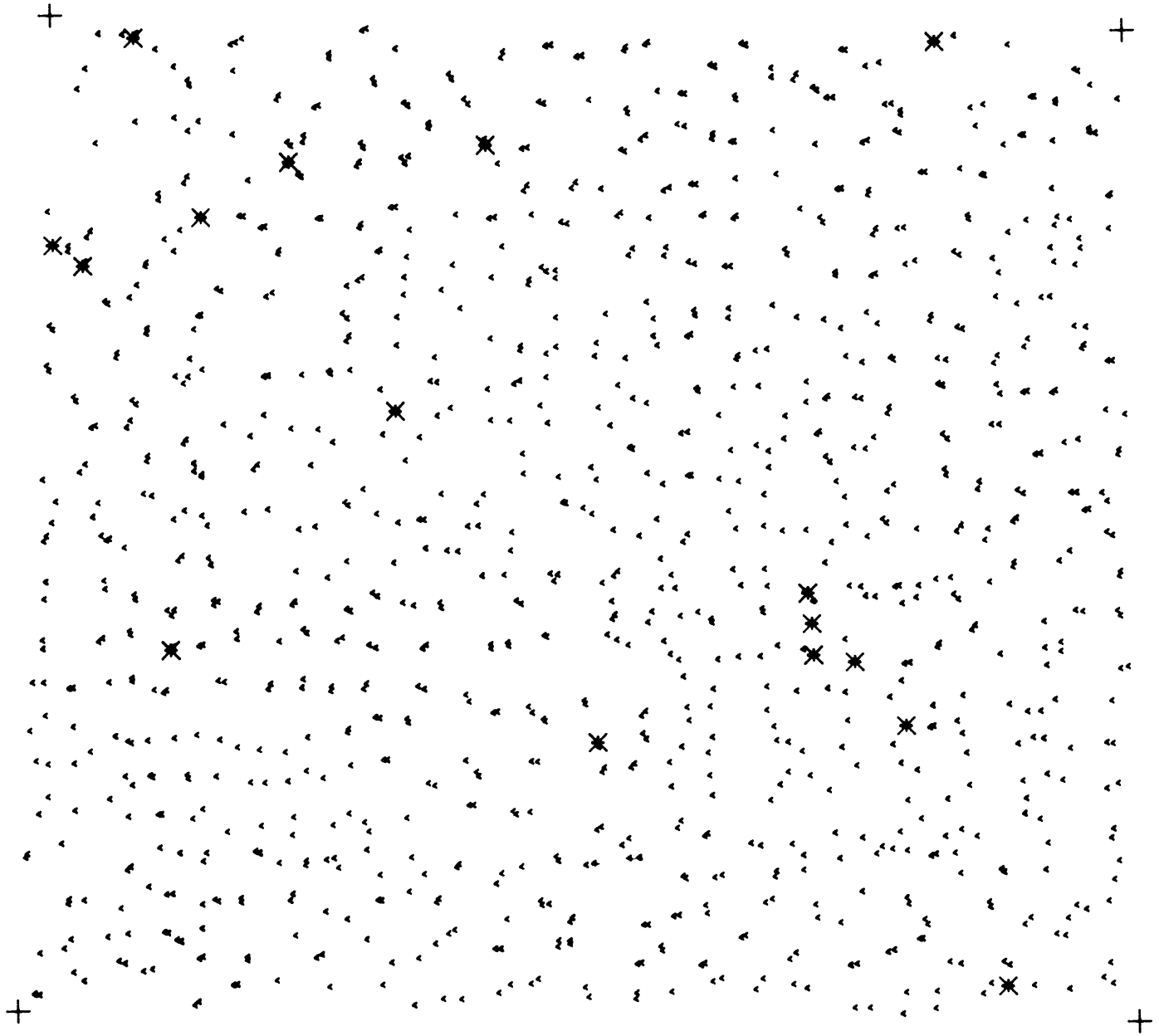

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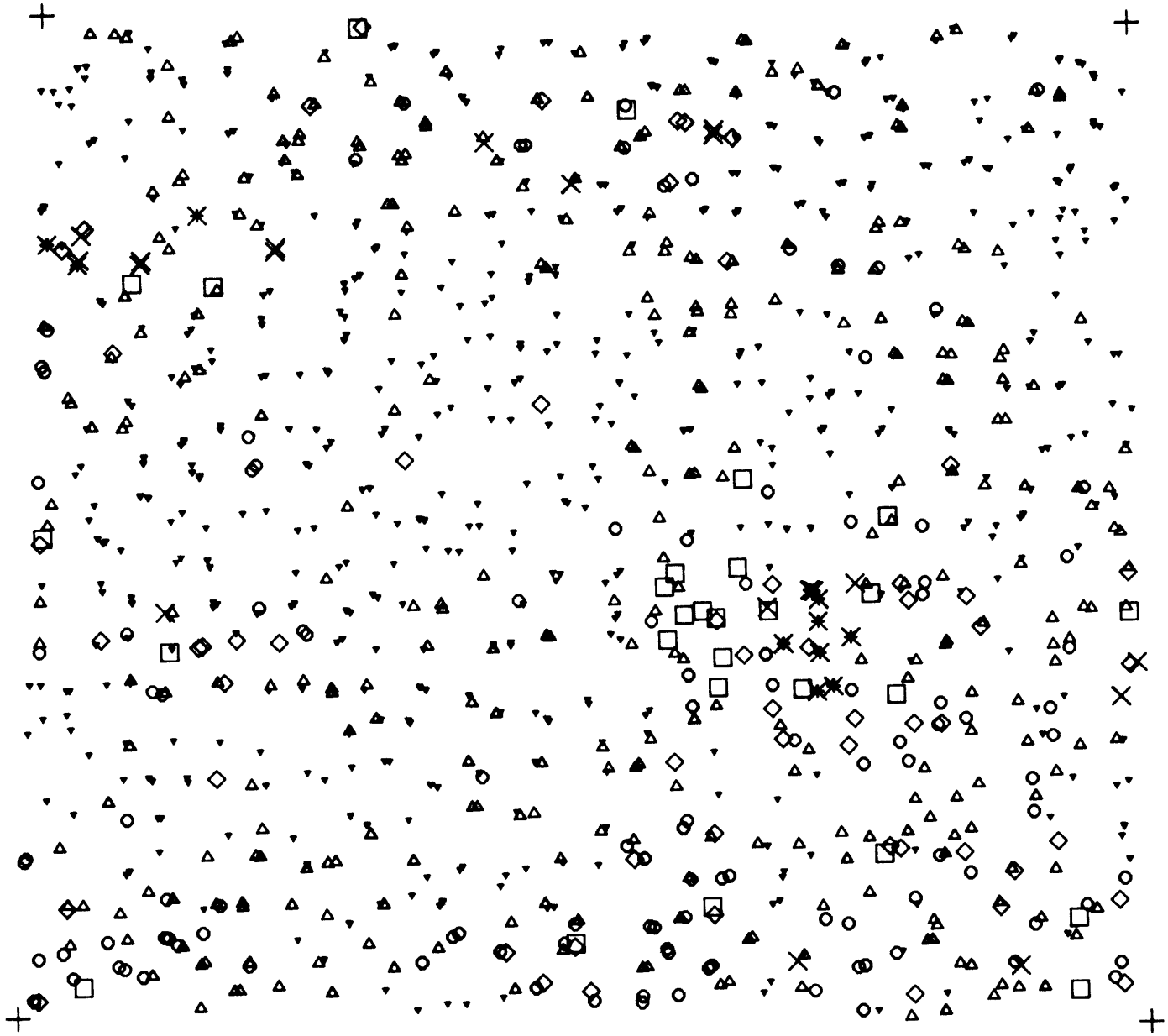

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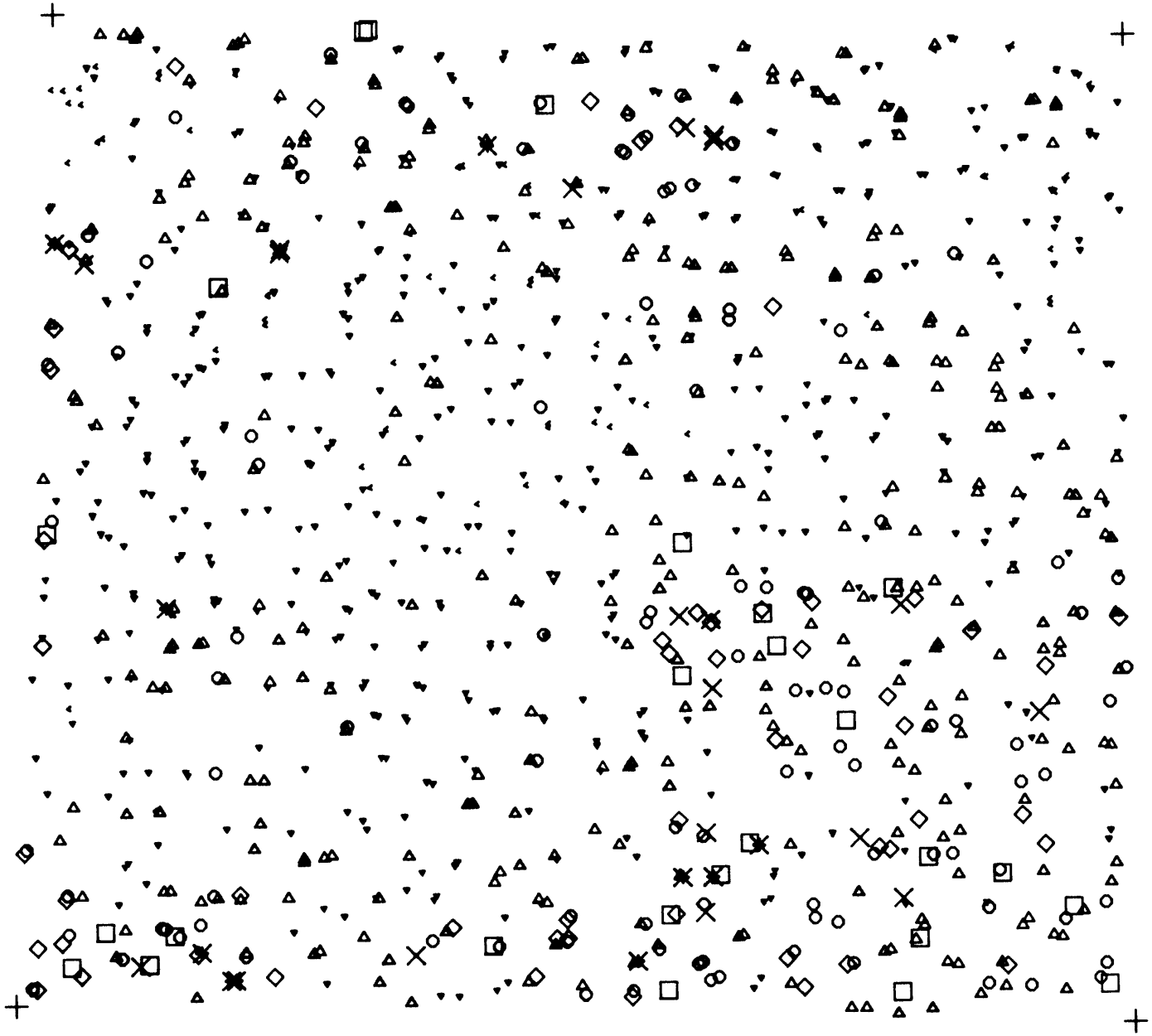

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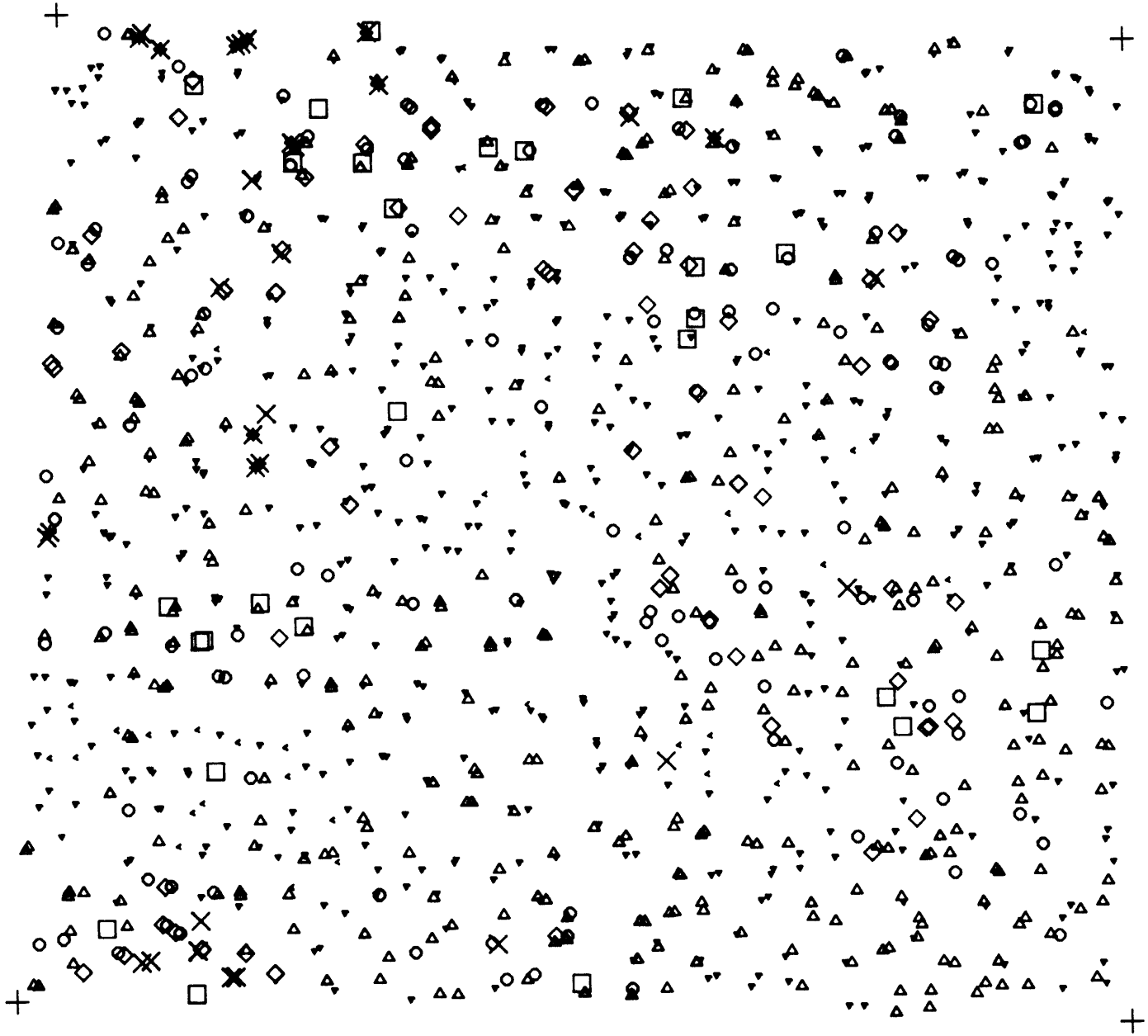

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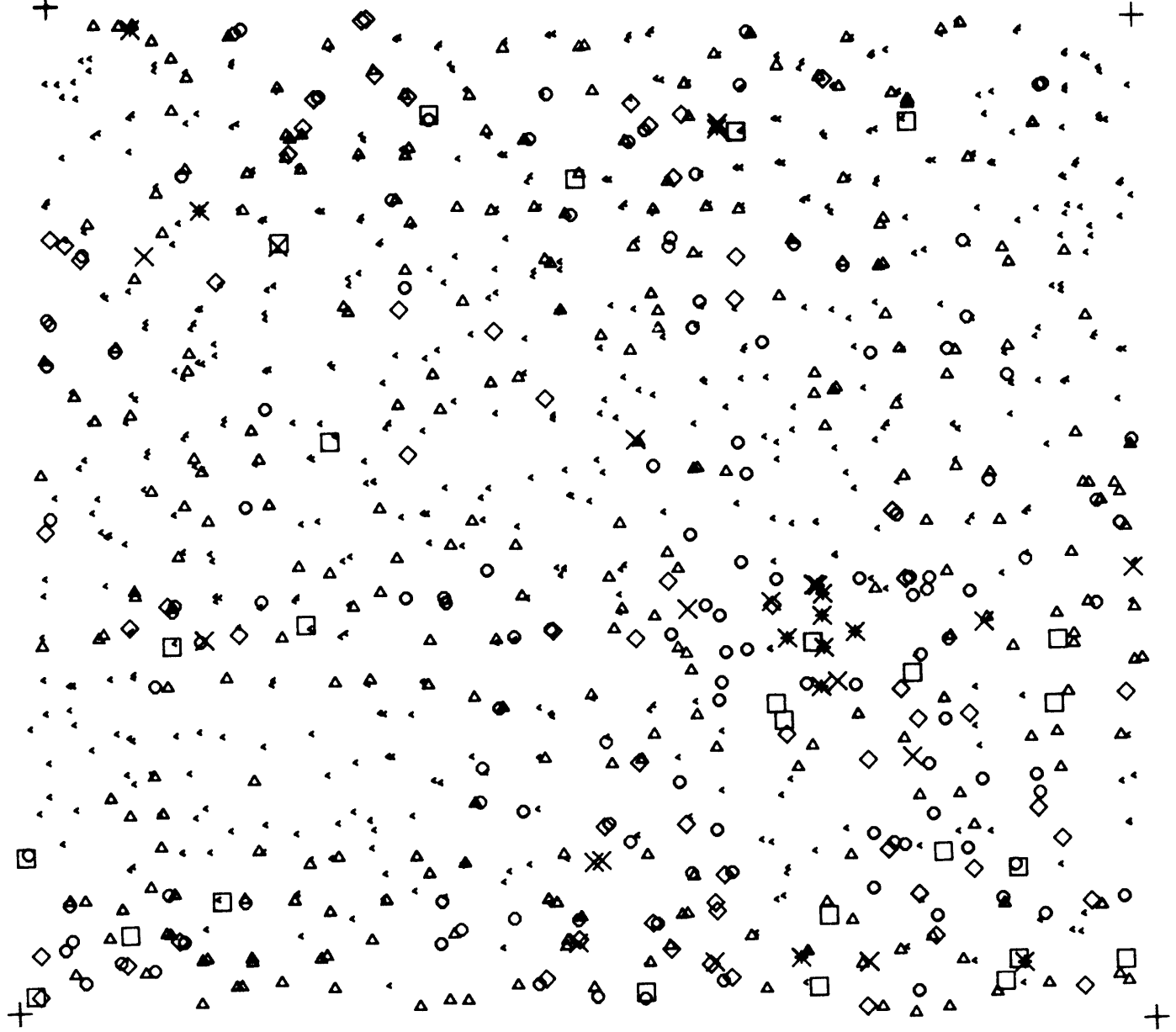

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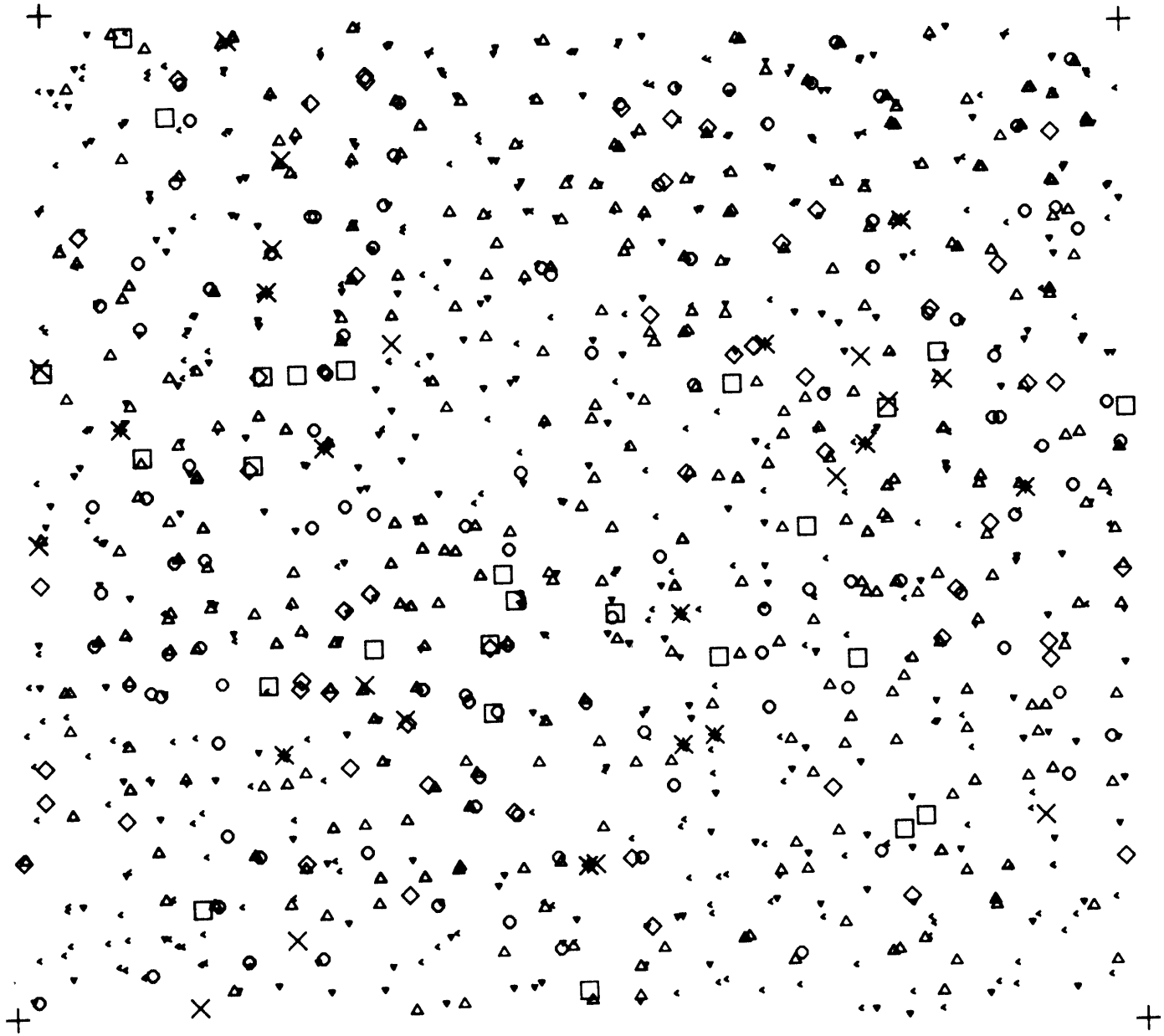

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